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APRIL

THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION

Educational Requirements—*Gies*
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EDITORIAL
Dental Journalism

COUNCIL ON DENTAL THERAPEUTICS
Epinephrin

DENTAL HEALTH EDUCATION
Public Dental Clinics
—*Milberry*

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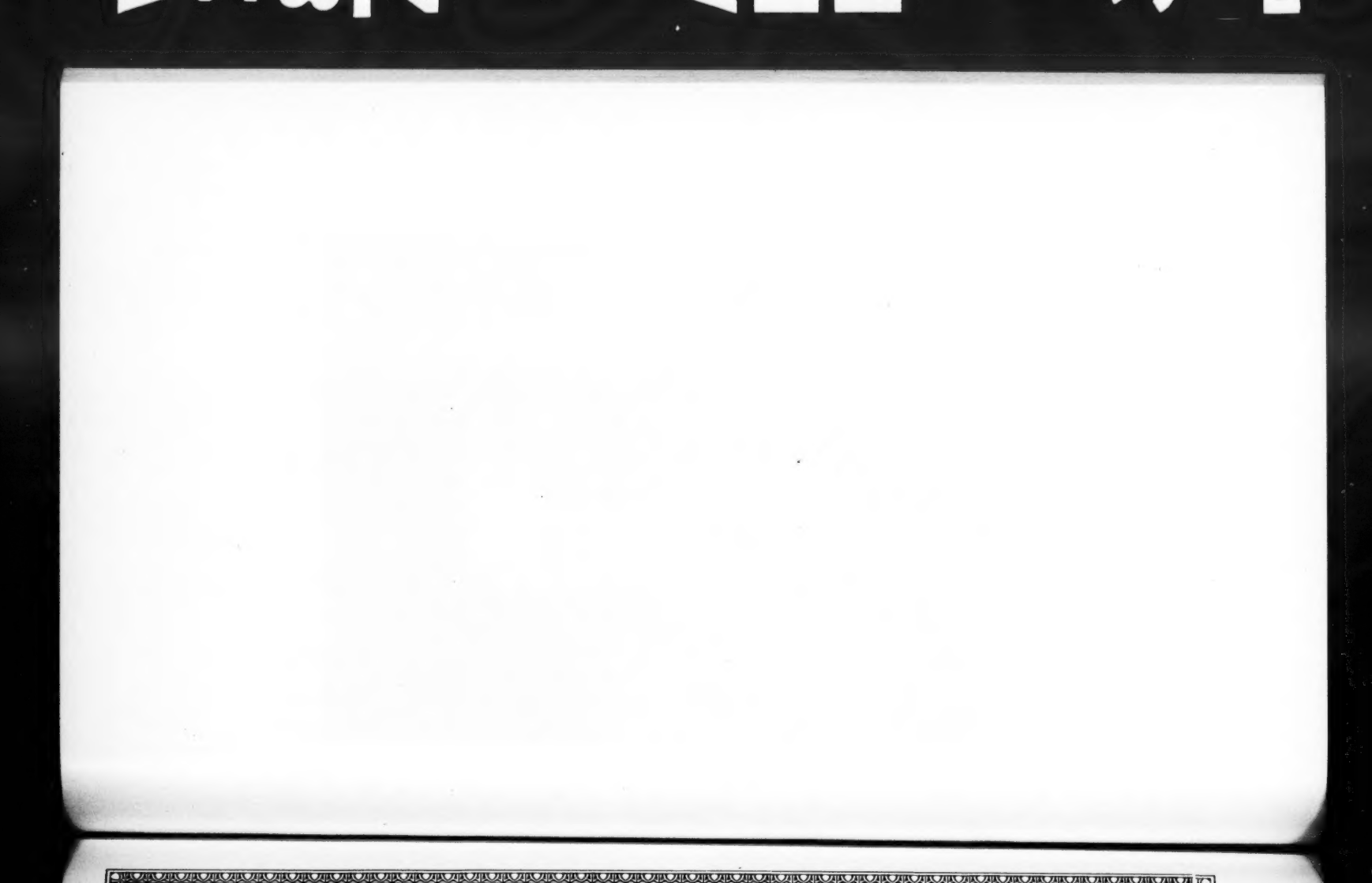

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THE JOURNAL
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Original Communications

IS THE INFLUX OF NEW GRADUATES COMMENSURATE WITH THE DEMAND FOR DENTAL SERVICE, OR SHOULD THE EDUCATIONAL REQUIREMENTS BE ALTERED?*

By WILLIAM J. GIES, New York City

THE subject I have been invited to discuss has many complications. It consists of two direct questions: (1) "Is the influx of new graduates commensurate with the demand for dental service?" and (2) "Should the educational requirements be altered?" (presumably lowered to make the influx commensurate with the demand). A discussion of either question is apt to be affected at present by the pessimism of the prevailing business depression, and also by the current economic perplexities in dentistry. I shall proceed without overemphasizing temporary influences, or permitting my remarks to acquire either a blue tint at one extreme or a red one at the other. Our subject, because of its hypothetical character, must be discussed chiefly in terms of conviction, opinion and probability. Therefore, when I use the words "I believe," or others to the same effect, you will understand that, in the absence of some needed data which are not available anywhere, an expression of conviction or of opinion is the only alternative.

The key-word in the subject is "demand." By "demand," I understand the wish and will for dental service as actually shown by patients in seeking and obtaining such service. If we interpret "demand" in this strict sense, judging from the observation that few dentists are being overwhelmed by an excessive number of patients seeking dental service, my answer to the first question in our subject is yes. By "yes," I mean that the existing supply of active practitioners, except in outlying districts where their spontaneous

*Read before the Section on Dental Economics at the Midwinter Clinic of the Chicago Dental Society, Feb. 4, 1931.

distribution is inadequate, seems to meet the actual demand for oral health service, as now shown by visits to dentists. The influx of new graduates seems practically to cover both the annual retirements of practitioners and the increase in the *exhibited demand* for dental service accruing from the growth of population.

If a strict interpretation of "demand" were adhered to, and if the views just expressed are sound, this discussion might profitably be discontinued at this point, for the second question in our subject would then automatically drop out of consideration. But I assume the subject was assigned in order that a more liberal interpretation would be considered. In addition to the "demand" for dental service that is actually registered in dental practice by approximately 25 per cent of the population, there is the remaining 75 per cent, which consists of two very large divisions. One group, although feeling the need for dental service and desiring it, is unable or unwilling to pay the current fees. The other group, because of ignorance, does not appreciate the desirability of such service. Although many in the latter group could afford to obtain dental service, they do not seek it. If, with these considerations in mind, we take the subject in a liberal sense, as I prefer to do, and assume that the key-word, "demand," is intended to refer to the existing need for dental service, the answer to the first question is no. By "no," I mean that the influx of new graduates is not commensurate with the real need for dental service, as experienced by practically the entire population.

The obvious distinction between exhibited demand and real need must be kept clearly in mind in any useful discussion of our theme. It is a function of the dental profession and of other health-service agencies to arouse the public to a full realization of the universal need for dental service, especially in its preventive aspects. Much has been accomplished in this direction, but much more must be attained. Cumulative success in this public effort will steadily bring the actual demand for dental service more closely into accord with the real need for it.

Table 1.—Total Attendance and Number of Graduates

	1920-1921	1922-1923	1924-1925	1926-1927	1928-1929	1930-1931
Total Attendance						
United States	11,745	13,099	11,863	10,333	8,184	7,997
Canada	1,249	1,153	713	456	375	326
Graduates (D.D.S. or D.M.D.)						
United States	1,795	3,271	2,590	2,642	2,442	....
Canada	191	398	205	136	102	....

As has already been suggested, the influx of new graduates is commensurate with the exhibited demand for dental service. Perhaps you do not agree with this opinion, and are inclined to ask: What about the diminishing attendance at dental schools, and the prospect a few years hence? I have not ignored this situation. The Annual Report of the Carnegie Foundation for 1930 will contain this statement:

> The total attendance at the dental schools in the United States has steadily decreased from a maximum of 13,099 in 1922-23, to 7,679 in 1929-30, an average annual loss of 774 students, or approximately 19 per school per year. In Canada the total attendance has

shown an analogous fall from a maximum of 1,249 in 1920-21 to 338 in 1929-30, an average annual loss of 101 students, or about 21 per school per year. That the decrease in total attendance at the dental schools in the United States will probably be followed by a cumulative increase, however, is suggested by the fact that in nineteen schools the first-year classes in 1929-30 were larger than the first-year classes in 1928-29 and larger than the graduating classes in 1929-30.

Wishing to supplement this statement with the latest available data, the deans of all the schools were recently asked to send me their figures for attendance as of Dec. 15, 1930. All the deans kindly responded and through their courtesy the following may be added. The total attendance of 7,679 in the thirty-nine United States schools last year has increased to 7,997 this year—a net gain of 318. This is the first increase in the total attendance since 1922-1923. It would indicate a definite turn in the tide, if the total number of first-year students this year were not nearly 200 less than the total number of first-year students last year—a decrease that appears to be due to special financial conditions. But there are suggestions that, despite the present economic depression, the attendance of first-year students in the United States has "struck bottom." In twenty of the schools, the present first-year classes are larger than the first-year classes last year, and larger than the senior classes this year. In twenty-four schools, the first-year classes this year are larger than the present second-year classes.

In the five Canadian schools, the total attendance of 338 last year has decreased to 326 this year—a net loss of 12. The total number of first-year students is larger than the number in the second year. In only one school is the present first-year class the largest. In three schools, the first-year classes this year are larger than the present second-year classes.

The figures for total attendance and number of graduates, at intervals since 1920, for the schools in the United States and Canada are given in Table 1.

Table 2.—Total Attendance By Classes

	First year	Second year	Third year	Fourth year	Total
United States Schools					
1928-1929	2,323	1,736	1,566	2,559	8,184
1929-1930	2,073	2,040	1,812	1,754	7,679
1930-1931	1,906	2,094	2,076	1,921	7,997
Canadian Schools					
1928-1929	81	90	93	112	376
1929-1930	58	78	98	104	338
1930-1931	79	60	80	107	326

Data for total attendance by classes, in the schools in the United States and Canada, during the past three years, are given in Table 2.

In any interpretation of the significance of the decline in attendance, an outstanding fact must be clearly recognized. For a decade, the dental schools in Canada and the United States have been passing collectively through an important evolution, involving in all of them the added requirement of at least one year of approved work in an accredited academic college for admission, and a cumulative increase in the number of

schools that exact at least two years. At present, the five Canadian schools are proceeding on the total time-equivalent of the 2-4 plan. In the United States, sixteen of the thirty-nine schools now require two predental college years for admission. The striking character of the evolution in the United States may be noted from the data in Table 3 for three stages of progress. A decrease in attendance, and the discontinuance of weaker schools, usually characterize such beneficial readjustments as those now in progress in dental education. This was illustrated in the recent reconstruction of medical education. Heavy losses in attendance at the medical schools for a period of years have lately been followed by maximum enrollments. During the period of declining attendance in medical schools, there was no shortage of physicians except in outlying districts where their spontaneous distribution had been inadequate. At present, there is no other deficiency in the number of physicians. Fortunately, the present recession in the graduation of dentists, as was formerly the case with that of physicians, has occurred after a long period of overproduction, and effective readjustment in dental education is taking place without causing a shortage of practitioners to meet the exhibited demand for dental service.

The total number of graduates of the dental schools in the United States, annually from 1910 to 1930 inclusive, is indicated in Table 4. Overproduction

TABLE 3.—CLASSIFICATION OF DENTAL SCHOOLS IN UNITED STATES ACCORDING TO (a) MINIMUM ACADEMIC REQUIREMENT FOR ADMISSION TO FIRST-YEAR CLASS AND (b) EXTENT OF UNDERGRADUATE PROFESSIONAL CURRICULUM

Academic Years	Plans*						Total Number of Schools	Number of Schools Requiring at Least Two Academic-College Years for Admission
	0†-4	1-4	2-3		2-4	3-4		
			Short Years‡	Long Years‡				
1920-1921	44	1	0	0	1	0	46	1
1925-1926	15	25	1	0	2	1#	44	4
1930-1931	0	22¶	5	2§	9**	0	38¶	16**

*The first numeral in each heading indicates years of required work in an academic college; the second, years in the undergraduate professional curriculum.

†Graduation from a four-year high school was sufficient for admission.

‡"Short years" signifies years of conventional academic length in the dental school; "long years," academic years that include summer "quarters" in the dental school.

#School of Medicine and Dentistry, University of Rochester; had no dental students; in dentistry now offers graduate work only.

¶This total does not include the 1-4 school in the University of Denver, having only two small classes (12x2), which will be discontinued in June, 1931.

§At Northwestern University, the four-year curriculum, based on a minimum admission requirement of one year of approved work in an accredited academic college, may, at the option of the student, be completed in three years of twelve consecutive quarters.

**The five Canadian schools are proceeding on the total time-equivalent of the 2-4 plan. Of the forty-three schools in the United States and Canada, twenty require two years of approved work in an accredited academic college for admission.

culminated in 1919, although the number in 1924 was almost as large. The totals for the decades ending in 1919 and 1929 were 24,769 and 24,006, respectively.

Extension of the curriculum from three years to four beginning in 1917-1918, and war conditions, account for the drop in 1920-1922 inclusive. Annual increase in the number of schools that required one predental college year for admission, beginning in 1921, caused decreases that were initiated in 1925. The admission requirement of one year of approved work in an accredited academic college, exacted in all schools beginning in 1926-27, first showed its effect in 1930. In 1933, the number of graduates may not be more than half that in 1923. Thereafter, the number will probably again increase cumulatively.

Table 4.—Number of Graduates of Dental Schools in the United States, Annually, Since 1910

Year	No.	Year	No.	Year	No.	Year	No.	Year	No.
1910	1,646	1915	2,388	1920	906	1925	2,590	1930	1,561
1911	1,742	1916	2,835	1921	1,795	1926	2,610		
1912	1,940	1917	3,010	1922	1,765	1927	2,642		
1913	2,022	1918	3,345	1923	3,271	1928	2,563		
1914	2,254	1919	3,587	1924	3,422	1929	2,442		
	9,604		15,165		11,159		12,847		1,561
Average	1,921		3,033		2,232		2,569		1,561

If you agree that the current influx of new graduates is commensurate with the exhibited demand for dental service, but not with the real need for such service, our attention may be turned to the second question in our subject: "Should the educational requirements be altered?" Whereupon numerous problems in dental education arise. Before considering any of them, let me indicate my general standpoint in their discussion, so that you may be prepared to detect at once any fallacy in my conclusions. I am confident that, as the real need for dental service is converted by health education into actual demand for such service, the number of dentists, except where the spontaneous distribution in outlying districts might be inadequate, will, by a natural response, be increased in accord with the exhibited demand. It seems certain that this desirable balance between supply of practitioners and demand for service will be maintained in dentistry, as in medicine, on a relatively high plane of education. I believe all this because it is indicated by current economic, social and professional conditions, by American tendencies and by common sense. The longer and more intensively I study dental problems, the more firmly I am convinced that dentistry should and will be maintained as a separately organized profession, but developed into the full service-equivalent of an oral specialty of medical practice, with correlative intimate cooperation between physicians and dentists; also, that this should and can be accomplished without burdening dentistry with the redundancies and irrelevancies, for dental practice, of the full conventional training for the M.D. degree. The reality of service equivalence can and will be achieved by

men and women trained intensively in all aspects of the practice of dentistry, and devoted to its ideals and to its advancement in the public interest; and this desirable equivalence will be attained at a minimum cost to the prospective practitioners in money, effort and time.

I have based upon broad principles the conviction that dentistry, both as a profession and as a practice, can best be promoted in the public interest by a system of organization, education and public regulation that will insure continuance of its present intensive development, and that will prevent it from falling into the relative neglect that would occur if it were submerged in conventional medicine. Recently, several of these principles have been briefly intimated in another relation by President Butler of Columbia University. Following is a quotation from his last annual report (page 41), issued late in December, 1930:

> The university study of business organization, business principles and business methods stands in the same relation to the study of economics, sociology and law that the university study of engineering occupies in relation to mathematical and physical science. *It profits by a separate organization and by an independent university consciousness just as does engineering and for like reasons.*[1]

True of business and of engineering, these principles apply equally to dentistry, which, as a separately organized profession in America, will, in 1939-1940, be 100 years old—an age that testifies not only to its virility, usefulness and permanence as a profession, but also to the fidelity of a long and sturdy succession of devoted practitioners.

For the sake of progress in our discussion, assume that these views of the status and relationships of dentistry are not warranted. Assume, also, that the educational requirements for new graduates must be "altered" in order to produce a much larger supply of dentists to meet an increased actual demand for dental service. Turn first to the latter problem: How should the educational requirements be altered? Should they be lowered in general education or in professional training, or in both?

Occasionally, one hears the suggestion that the requirements for admission to dental schools are too "steep," and that graduation from a high school should be sufficient. The general level of education in this country, like the scale of living, has been ascending. Do we wish to lower either? The professions cannot reasonably weaken their foundations in general education. The dental profession is continually becoming more proficient, and is steadily rising higher in cultural relationships. I am unable to suggest that it should be lowered in public respect, and its service rendered inferior, by diminishing the requirements in general education for admission to dental schools. Such a step backward and downward would rapidly increase the number of dentists, but, in more than one sense it would also cheapen their service. Dentists should not be educated on a plan that would, indifferently, leave them deficient in what the public calls "general culture," nor trained insufficiently to carry the heavy responsibilities that devolve on each member of a learned profession.

To require dentists to obtain a full conventional medical training and the M.D. degree, before receiving a further special training for dental practice, would certainly "alter" the requirements under discussion, but obviously would not help to increase the influx of new graduates. I have just suggested my conviction that this plan, if put into operation, would undesirably affect the future development of dentistry. This type of combined med-

1. Italics not in the original.

ical and dental training has long been open to all who are competent voluntarily to obtain it. There must be excellent reasons for the general failure to do so. Now and then, in New York, we hear about a so-called "stomatologic movement in America." Perhaps with the aid of a microscope, you could find some of it out here. This "movement," which seems to resemble an antiperistaltic movement, is said to have been begun in 1923. If that is so, then for eight years about a quarter of a million of practitioners in medicine and dentistry in the United States have been eligible to give this movement force and effect. Very recently, the society that claims to embody this movement published its roll of membership. Of a total of seventy-nine members, sixty-four reside in the United States. This society, which seems to suffer from incurable infantilism, includes the following declared purpose among its stated objectives:

> To demand [sic] the universal recognition of stomatology (dentistry) as the practice of a medical specialty and not as a branch of the Public Health Service; and the recognition of all teaching of stomatology ("dentistry") as graduate work and dental schools as graduate schools; and the requirement of a *full* medical qualification (graduation from a duly recognized medical school) for admission to such graduate professional schools of stomatology (dentistry).

It is a tribute to the common sense of Americans that this "demand" is receiving no marked encouragement from either dentists or physicians.

If the general requirements for admission to dental schools should not be lowered, and the requirements in professional years should not be materially increased, what may be said of several alternatives that have been suggested? Consider first a plan intended to divide the practice of dentistry between a few learned physicians and many unlearned assistants. Ten years ago, when the Carnegie Foundation began the study of dental education, one of the first problems we faced was the proposal then current that (1) certain advisory, consultative, diagnostic and surgical phases of dental practice be restricted to the function of the physician; or (2) that dental practice be based on a full training for the M.D. degree, but made an accredited specialty of statutory medical practice, (3) but that such procedures as filling, cleaning or otherwise mechanically treating teeth, or fitting substitutes or appliances, should be left to "trained mechanics" working "only under the direction of 'oral specialists,'" (4) the directive and prescription-writing medical practitioners of oral health-service to be "stomatologists," the subordinate and prescription-filling technicians to be "dentists." It was urged that this plan would put dental practice into the hands of a few competent and wise directors who, with low-salaried helpers, would give perfect dental service at very low cost to patients. For convenience in discussion at that time, we called this scheme the "master-servant plan." After a general examination, it did not appeal to us as a desirable plan; nearly all of the many who were consulted condemned it for a variety of convincing reasons; and, having been rejected because of its unsuitableness, it soon ceased to engage active attention. During the past few years, there has been an endeavor to synthesize effective support for this plan. A few months ago, the plan, dressed up in a new costume, was presented in the published annual report of a dean of an eastern university dental school to the president of the university, and its adoption urged.

The "master-servant plan" for the reorganization of dental practice, as thus

revived, is based upon the assumption that the dental profession is incompetent and cannot be improved. The plan proposes that, in the conduct of dental practice, physicians who would specialize in dentistry diagnose oral conditions, and direct unlearned assistants to do the practical intra-oral work of operative dentistry. Each physician-in-charge, it is confidently asserted, "would be able to direct at least twenty assistants with the greatest ease." These assistants would receive the minimum public-school education required by law for all children. More education than that would be unnecessary and would interfere with the purpose to keep their wages low. Their technical training would be obtained in "one year or less." It is alleged that higher quality, lower costs and wider distribution of dental service would result from adoption of this plan, and thus justify the consequent extinction of the dental profession. Under the plan, operative dental practice, that is, treatment within the mouth, would be directed by masters, who would be able to execute skilfully very few if any of the required dental operations. They would be assisted by unlearned servants who, lacking understanding of the medical, mechanical and esthetic principles involved, would perform the operations empirically. The master, unskilled in dental technology, would not comprehend or appreciate the refinements of current practical developments in operative methods. The servants, untrained in principles, would have no incentive to learn to do what the master did not prescribe. Dentists are now steadily being educated more effectively to understand, and themselves to apply, both medical and mechanical principles in dental practice. If, as is contended for the revived master-servant plan, dentists having this double training cannot proceed satisfactorily, one wonders by what manner of reasoning it may be logically concluded that dental practice would be made more nearly perfect by masters who would not know how to apply mechanical principles, aided by servants who would not understand pathologic conditions.

Adoption of the master-servant plan would require medical schools to give instruction in dentistry as an accredited specialty of statutory medical practice, coequal with the other specialties. There is no evidence that there is any practical interest in this matter in schools of medicine or in the medical profession. The manner in which, and the institutions where, the multitude of servants would be trained in "one year or less" have not been indicated.

If one master may direct "at least twenty" servants in dental practice, this arrangement would also hold, for the same reasons, in medical practice; and because of its obvious cheapness, the public might expect it to be extended accordingly. Thus, of twenty or more unlearned servants, each could be trained, as biologic joiners, to perform empirically a single operation, such as tonsillectomy, and the master, diagnosing the conditions, could send the patient to the corresponding surgical servant, in Room 10 for example, and thus reduce the cost of a $500 operation to about $10, or less. Even in internal medicine, where the difficulties and uncertainties are greatest, boys and girls carrying satchels containing pills, powders, etc., in numbered containers and instructed in the art of noting symptoms, could, at, say, $2 a day, visit the homes of chronic invalids, check off on printed slips the symptoms observed, report to the master by telephone such symptoms as they noted, receive from him in reply immediate instructions to give doses 5, 10 or 15—or all of them, to miss nothing—

and thus, rapidly going from house to house, make it easy for the master to give treatments at about 25 cents each. On such a plan, the master might not have to see the patient before signing the death certificate. It is difficult to believe that the cost of medical "care" (?) could be reduced any lower than it would fall under this plan, although the use of television and robots might be held in reserve for that purpose.

The master-servant plan should be rejected by the dental profession, and should not be encouraged in any university, because, if put into operation, it would

1. Injure public health, by lowering the quality and usefulness of dental treatment and operations to the level of the empiric capacity of unlearned servants.

2. Impair personal health-service in dentistry by weakening or destroying the intimate relations, between responsible practitioners and patients, on which the most useful health service of all kinds depends.

3. Minimize the importance of the mechanical and esthetic procedures of operative dentistry, and distract attention from the need for their cumulative betterment.

4. Encourage the public to make the masters as well as the servants the agents of the state, and thus promote adoption of "state medicine."

5. Eliminate the schools of dentistry, and divert their accumulated assets to purposes other than those on which the segregation of the assets has been based.

6. Humiliate all dentists and violate the implications, in the covenant between practitioner and public, on which the license to practice is predicated.

7. Disorganize the dental profession, and dishonor especially the history and traditions of dentistry in the United States and Canada.

8. Prevent the public advantages that will steadily accrue from the continued evolution of dentistry into the full service-equivalent of an oral specialty of medical practice, which dental leadership is now bringing about at a minimum cost in money, effort, and time for the practitioner, without burdening dentistry with the redundancies and irrelevancies of a full conventional training for the M.D. degree.

There is another plan for the reconstruction of dental education that would give dental practice the quality we hope to see it attain, without encouraging any educational excesses, and without disregarding economic essentials. I refer to the "2-3 graduate plan." This plan favors completion of the professional curriculum in three academic years, lengthened to include summer sessions where desired. It facilitates concentration on the training for general practice in three years, and encourages voluntary graduate work in training for the specialties. It enables the general practitioner to begin his professional service one year earlier than is possible on the 2-4 plan, and an added year of immediate graduate work for the specialist does not delay the beginning of his service beyond the requirements of the 2-4 plan. At present, seven dental schools and seven medical schools are concentrating a four-year curriculum into three years. I mention this plan in passing because it has an important bearing on the problem of the most desirable requirements as affecting the influx of new graduates. Having sponsored this plan since 1922, and having abiding faith in its usefulness, I refer to it briefly to reaffirm this faith.

I had planned to devote the concluding section of this paper to some general conditions bearing on our subject. Just before coming to Chicago, however, I

learned about an important development of two weeks ago, affecting the Chicago Dental Society, that illustrates the public advantages of the suggestions I expected to offer. In order to continue the discussion without special reference to local conditions, that the opinions to be expressed may be seen primarily in their general relationships, I shall quote freely from my founder's day address at the Medical College of Virginia, in Richmond, Dec. 1, 1930, as published a few days later in the delayed November number of the *Bulletin* of that College. In that address, after referring to the fact that there are two sides to each of the questions involved in the "costs of medical care"; namely, the public's side and the practitioner's side, attention was drawn in some detail to the legitimate claims of each side for consideration, and then the following was said:

"State medicine" will lose its appeal, as a practical solution of present difficulties, if the organized health-service professions meet the situation in full accord with their humanitarian purposes and in due recognition of existing economic inequalities. *This they can do by systematically organizing and maintaining institutions to provide excellent preventive and clinical health-service at moderate fees specifically for patients having low income, such institutions to be established under professional auspices where, when, and as community needs would determine.* This plan would put the problem directly into the hands of the organized health-service professions themselves. These professions are obviously the most competent agencies to devise ways and means for its solution. Public-spirited laymen would certainly cheerfully cooperate.

If this general plan were put into operation, great difficulties would disappear and only minor ones would arise. The prospective institutions, given any name you please, would be envisaged by all ethical practitioners as professional responsibilities. Philanthropic or community resources, legislative grants, industrial allowances, insurance funds, club gifts, and other support, would be obtained for their establishment and maintenance. The organization of these health-service institutions would be expertly guided and their functions controlled by the professions most competent to do so. They would represent constructive efforts to supply excellent service through professional agencies that would not compete unfairly with private practitioners. They would be manned by practitioners selected by their colleagues for their tested adaptability to practise in such institutions. These selected colleagues, paid generous salaries from the available endowments, would consciously serve not only the best interests of the public but also those of the health-service professions affected, and their functions would be thus accredited. The plan would assure high consideration for selected deserving patients of low income; economic justice for the private practitioner; maintenance of the private practitioner's initiative, individuality, and personal relationships with his patients; and unimpaired continuance of the progress of health service in its present educational and scientific evolution. There would be desirable accommodation of the interests of public and practitioners, without indifference or injustice to either. *There would be a wide increase in the benefits of health service among the many who, for economic reasons, now fail to obtain it.* There would probably be no appreciable diminution in the number of persons who would continue to prefer, and who would actually pay adequate fees for, the services of private practitioners.

In communities needing such institutions, their creation might tend to reduce somewhat the required number of private practitioners, but this would probably occur chiefly in sections where private practitioners are now rapidly diminishing, and also among the practitioners who are least competent, or least acceptable to patients. Reductions for these reasons would not seem to be undesirable. Suitable geographic distribution of the proposed service institutions as health centers in rural communities, *under the auspices of state and county professional organizations,* would remove most of the special difficulties attending adequate medical care in sparsely populated districts. . . .

The chief obstacle in the way of this plan is the need for funds sufficient in each such institution, large or small, to enable it to provide all required facilities, to pay proper salaries, and to render excellent professional

service at fees that collectively would not be equal to the total expense. In this respect these institutions would be like . . . health-service colleges . . . which, for example, do not charge, for tuition, fees that equal the cost of the instruction given, but depend upon income from other sources to facilitate this generosity. It is reasonable to believe, in the light of current events, that funds in adequate amounts would become available wherever the beneficence of the plan would, under professional leadership, appeal to the public.

It seems clear that, measured in values for the public, such a voluntary procedure under contented professional auspices would be superior to any plan, with similar intent, that might be enforced in disregard for professional interests and judgment.

The main feature of this plan is the professional organization and control of the proposed service institutions. The persons who are trained in universities and licensed by the states to be community experts and leaders in medicine, dentistry and the other health-service professions are obviously most competent collectively to establish and to manage such institutions in the public interest. If they are not, who would be? Lay cooperation rather than lay control, and complete freedom from political relationships except such as would bring disinterested support, would be essential. In matters of organization affecting financial, legal, civic and other conditions, lay cooperation rather than lay dominance in the boards of directors would meet all requirements for the perfect conduct of such institutions in all extraprofessional relationships. In the same address, the following opinions were also expressed:

The organized health-service professions, founded as they are on humanitarian principles, should not be content to regard social welfare as merely a casual by-product of competition for private economic gain, but should, as *organized professions,* awaken to the need and opportunity to *plan* and to *endeavor,* in the health-service field, to prevent disease in the supposedly well and to cure or relieve sickness, *on an increasingly comprehensive scale,* and in a way to benefit all within the means of each. The professions which have made some of the most important contributions to the refinements of civilization, the professions which have lengthened life expectancy and enhanced its satisfactions, the professions which have served humanity with extraordinary fidelity and success—these professions [of which dentistry is one], because of their noble quality, may be reasonably expected to rise steadily higher in their beneficence.

I believe that if this spirit and this program were fully exemplified by dentistry, the appreciation of a grateful public, and the consequent happy readjustments within the profession, would solve many problems, and also would remove all occasion for anxiety as to whether the influx of new graduates will be commensurate with the demand for dental service.

NORMAL ANATOMIC AND PHYSIOLOGIC GINGIVA AND ITS RELATION TO PATHOLOGIC PROCESSES*

By WILLIAM G. SKILLEN, D.D.S., Chicago, Ill.

IT has been said[1] that the possibilities for shedding further light on so-called pyorrhea from the histologic and histopathologic aspects have been exhausted. If there is any truth in the oft-repeated statement that pathologic processes may be clearly understood only in the light of normality, and, it should be added, clinical practice finally placed on the same foundation, it would appear that such a remark is open to question.

At the present time, particularly as far as the gingivae are concerned, there appears to be no generally accepted normal, nor indeed a definite picture of any sort upon which to base a study of pathologic processes. Furthermore, it seems quite doubtful that even yet we are ready or able to formulate completely any such picture.

The information which may be gained from the literature concerning the subject is fragmentary and uncertain to say the least. No two opinions agree, and on some points considerable disagreement exists.

Any conception which may have been held in regard to the normal anatomy of the gingivae prior to 1921 was in some ways inaccurate. As a matter of fact, it is impossible to find anything like an adequate description of what that conception may have been previous to 1915,[2] and thus one gains the impression that but little importance was attached to such knowledge.

To Gottlieb must go the credit not only for adding materially to whatever little knowledge may have existed then, but still more for arousing a dormant interest and curiosity in this and allied subjects, and thus paving the way for further discoveries.

Although his first publication, in 1921,[3] aroused considerable discussion, no further important advance was made until 1929, when Becks,[4] in turn, made it necessary for us to modify somewhat our developing conception of gingival anatomy.

The views of these two important contributors seem to be as follows:

Gottlieb[5] apparently has drawn up two pictures in describing the characteristics of the gingivae. In the one, he speaks of an "ideal" arrangement, ideal from the

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*Read before the Section on Histology, Physiology, Pathology, Bacteriology and Chemistry (Research) at the Seventy-Second Annual Session of the American Dental Association, Denver, Colo., July 24, 1930.

1. Becks, Hermann: Pacific D. Gaz., 37: 259 (May) 1929.

2. Black, G. V.: Special Dental Pathology, Chicago: Medical Book Publishing Co., 1915.

3. Gottlieb, Bernhard: Deutsch. Monatschr. f. Zahnheilk., No. 5, p. 142, 1921.

4. Becks, Hermann: Normal and Pathologic Pocket Formation, J.A.D.A., 16:2167 (Dec.) 1929.

5. Gottlieb, Bernhard: Paradentalpyorrhoe und Alveolaratrophie, Fortsch. d. Zahnheilk., 1928, p. 400.

standpoint of affording immunity to both caries and pyorrhea, and which, apparently, he regards as definitely physiologic. In this picture, there exists no pocket (crevice), and the keratinized layer of the mouth epithelium continues over onto the enamel cuticle. As a part of this picture also, according to him, there occurs a shift apically of the epithelial attachment or gingiva, this change being indicated by proliferation of that epithelium along the root. (Fig. 1.)

But he also refers to another picture which he appears to consider of greater importance, at least from the standpoint of treatment. This, too, he apparently considers physiologic (Fig. 2), but, as far as I know, it has not been specifically de-

Fig. 1.—The "ideal" arrangement after Gottlieb (Fig. 203); distal surface of the tooth of a hedgehog. *K*, keratinized layer of mouth epithelium continuous with cuticle; *E*, epithelial attachment which has grown along the root from *T*, the cemento-enamel junction to *T'*; *D*, dentin; *S*, enamel space. There is no pocket and no inflammation: an anatomic and physiologic normal gingiva.

fined nor described. From the objective proof which is offered in evidence of its existence, one gets the idea that it differs to a wide extent from the "ideal" arrangement. In this case, there exists a pocket apparently quite variable in depth. Inflammation, sometimes quite pronounced, may be present. Apparently, too, débris and calculus may form part of this picture. If, indeed, we have interpreted Orban and Köhler[6] correctly, it would appear that almost anything, except ulceration of the epithelium, may characterize this physiologic arrangement. Gottlieb seems to take the following view. Although recognizing the definite physiologic aspects of the "ideal" arrange-

Fig. 2.—One stage of the physiologic concept after Gottlieb; gingiva of a human tooth. *C*, cuticle; *P*, bottom of pocket; *M*, mouth epithelium; *E*, epithelial attachment terminating at cemento-enamel junction, *T*; *I*, inflammation apparently traceable to pocket; *D*, dentin; *S*, enamel space. At the least, this is a histologic gingivitis.

6. Orban, Balint, and Köhler, J.: Die physiologische Zahnfleishtasche, Ztschr. f. Stomatol., No. 6, pp. 353-425, 1924.

ment, he believes it would be an error to designate only such as physiologic, and that we are not able to distinguish sharply between physiologic and pathologic, and apparently he does not feel it important to do so, but does consider it important that we be able to differentiate between what is "absolutely physiologic" and what "absolutely pathologic" from the standpoint of prophylaxis.

Becks[4] seems to accept these ideas in general. His physiologic arrangement (Fig. 3) appears to correspond in some ways with that set up by Gottlieb in his second picture. He differs from the latter in one or two respects. Whereas, Gottlieb regards pocket formation as due to a smooth, physiologic separation of the epithelium from the cuticle, Becks considers its formation to be due to a physiologic degeneration and desquamation of the epithelial attachment, simultaneous with, or following, the growth of the mouth epithelium downward behind it.

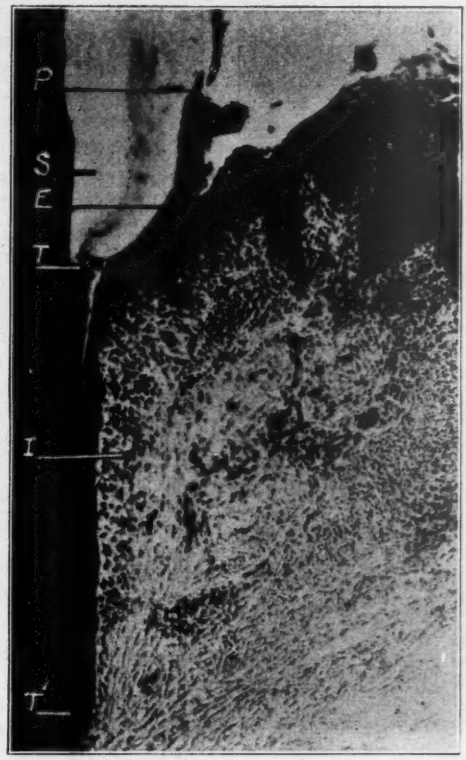

Fig. 3.—One stage of the physiologic concept after Becks (Fig. 11). *P*, bottom of pocket; *E*, epithelial attachment, grown along the root from *T*, the cemento-enamel junction, to *T'*; *I*, inflammation; *S*, enamel space. At the least, this is a histologic gingivitis.

They also disagree somewhat on the status of the shifting epithelial attachment. Whereas Gottlieb believes that this change is a physiologic process which may continue until the tooth is exfoliated, Becks regards it as a physiologic process only until the pocket reaches the cemento-enamel junction, after which time, any further change which occurs is pathologic.

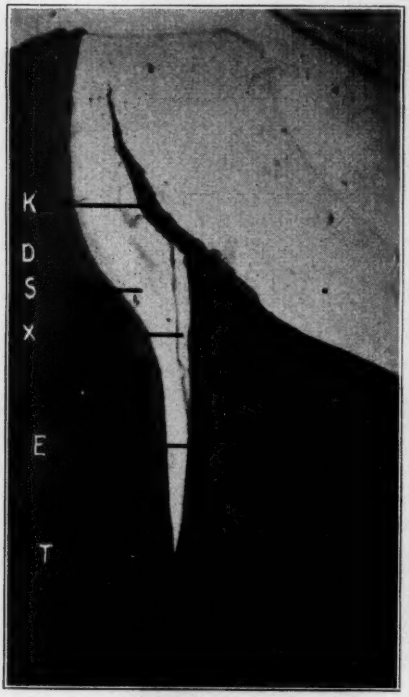

Fig. 4.—An anatomic and physiologic normal gingiva; lingual surface of dog's incisor; also an "ideal" arrangement. *K*, keratinized layer of mouth epithelium continuous onto the cuticle; *E*, epithelial attachment terminating at cemento-enamel junction, *T*; *D*, dentin; *S*, enamel space; *X*, artefact.

It may also be worth while to glance at the views of some other contributors.

Haupl and Lang,[7] who have taken some rather strong exception to some of the ideas of Gottlieb, particularly in regard to proliferation of the epithelium, are rather fragmentary in their description of that which might be taken to constitute the normal gingiva. They state that when the tooth comes into occlusion, there may or may not exist a pocket, and that the epithelial attachment terminates at the cemento-enamel junction. Any later change in this arrangement, and particularly any change in the epithelium, is, in their opinion, due to a pathologic process.

Weski[8] considers the pocket to be the result of an intra-epithelial tear, and to have reached a depth of 1.5 mm. when the tooth reaches occlusion. He further states that, at first, the epithelial attachment terminates at the cemento-enamel junction and is thin and nonpapillated. Later, it increases in thickness and grows down the surface of the cementum, in advance, apparently, of a further deepening of the tear which threatens to expose the connective tissue at the cemento-enamel junction. He further disagrees with the view of von Ebner, to which we will have occasion to refer again, that lymphoid tissue is a normal element of the gingivae.

Max Schniter,[9] more recently, agrees fully with the views of Gottlieb, emphasizing particularly the physiologic aspect of the shifting epithelial attachment. His objective proof is very similar in nature to that already described.

7. Haupl, K., and Lang, F. J.: Marginale Paradentitis, Berlin: H. Meusser, 1927, p. 27.
8. Weski: Vierteljahrsschr. f. Zahnheilk., No. 1, p. 1, 1922.
9. Schniter, Max: Deutsch. Monatschr. f. Zahnheilk., No. 9, p. 705, 1930.

Fig. 5.—Anatomic and physiologic normal gingiva on lingual surface of a rat's molar; also an "ideal" arrangement. *K*, keratinized layer of the mouth epithelium continuous onto the cuticle, *C*, and also covering the proliferated mouth epithelium, *M*; *E*, epithelial attachment forming the cuticle above the crest of the gingiva, and growing down the root, *T*-*T'*; *D*, dentin; *S*, enamel space. There is no pocket and no inflammation.

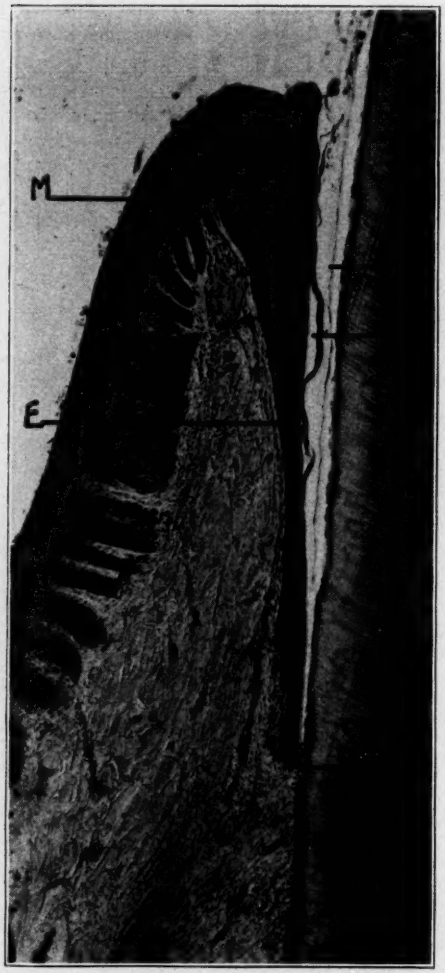

Fig. 6.—Anatomic and physiologic normal gingiva; monkey's incisor. *M*, mouth epithelium with a hint at keratinization, growing downward behind *E*, the epithelial attachment, which terminates at the cemento-enamel junction, *T*; *D*, dentin; *S*, enamel space; *X*, artefact. There is no pocket and no inflammation. The status from the standpoint of the "ideal" is questionable.

James and Counsell[10] merely state that any depth of pocket must be regarded as pathologic.

Box,[11] in his later publications, has apparently accepted Gottlieb's view of

10. James, W. W., and Counsell, Arthur: Brit. D. J., 48:1240 (Oct. 15) 1927.

11. Box, H. K.: Treatment of the Periodontal Pocket; Necrotic Gingivitis, University of Toronto Press, 1928.

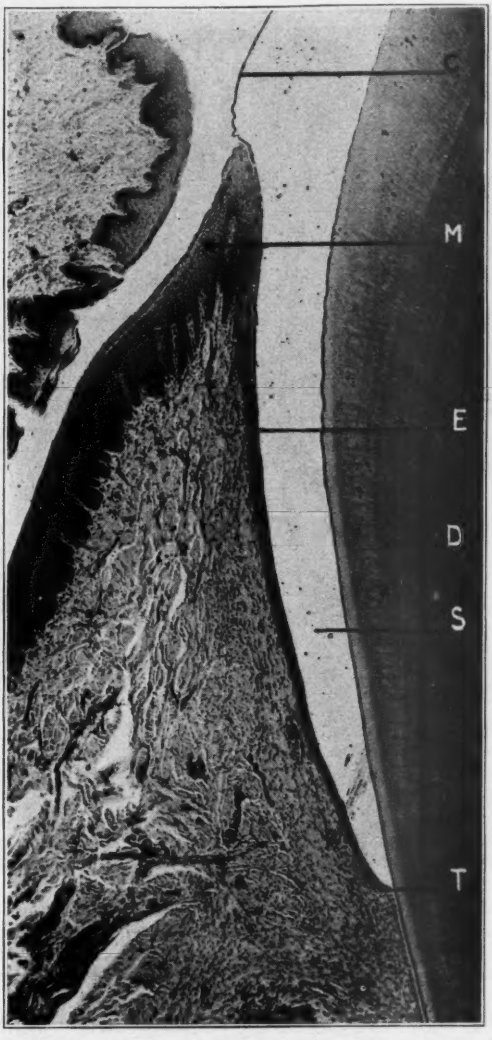

Fig. 7.—Labial gingiva of dog. *C*, cuticle; *M*, mouth epithelium; *E*, epithelial attachment terminating at cemento-enamel junction, *T*; *D*, dentin; *S*, enamel space. There is no pocket and no inflammation. Although in many respects normal, the exact status is questionable because of failure of development of the keratinized layer; not an "ideal" arrangement.

the attachment of the epithelium, but, beyond this, his ideas of normality are not clear.

Rudolf Weber,[12] very recently, in tak-

12. Weber, Rudolf: Paradentium, 1:29-33 (July 7) 1929.

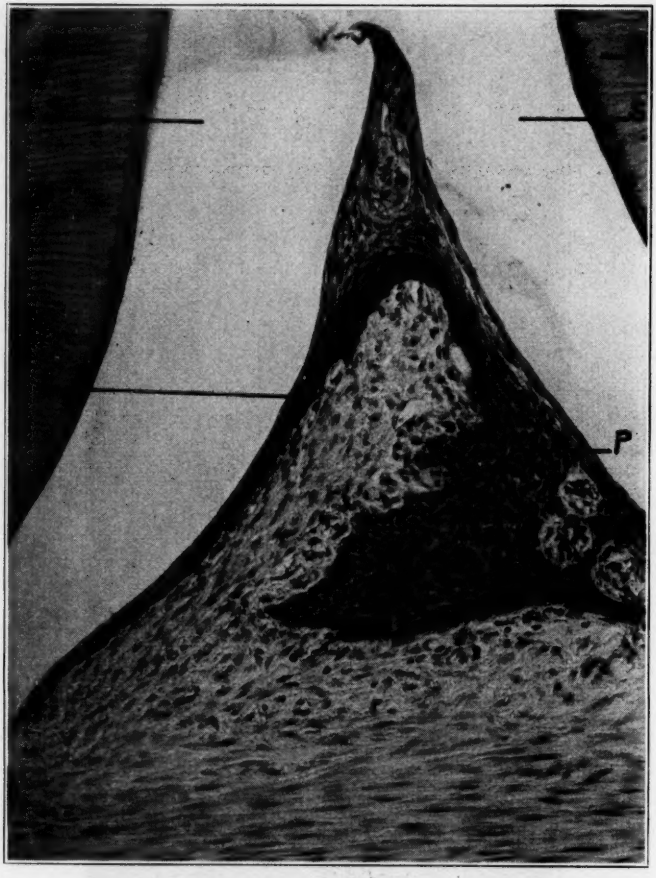

Fig. 8.—Anatomic and physiologic normal interproximal gingiva of a wild rat; questionable from the standpoint of the "ideal." *D,* dentin; *S,* enamel space; *E,* epithelial attachment which terminated at the cemento-enamel junction; *P,* proliferation of epithelium due to a foreign body. No proliferating mouth epithelium, pocket or inflammation is to be observed.

ing the view that such things as filth, foreign bodies and calculus, and the inflammation which results from them, are physiologic, seems to be describing, more or less, the physiologic picture heretofore mentioned. On this basis, he proceeds to build up a constitutional theory for the origin of pyorrhea.

Finally, René Vincent,[13] who seems to hold a somewhat unusual view, might be mentioned. Quoting Retterer, he apparently agrees with him, and inadvertently

13. Vincent, René: Le Rôle de la Tonsille Gingivale dans la Pathogénie de la Pyorrhée Alvéolo-Dentaire, Rev. de Stomatol., 31:249, 1929.

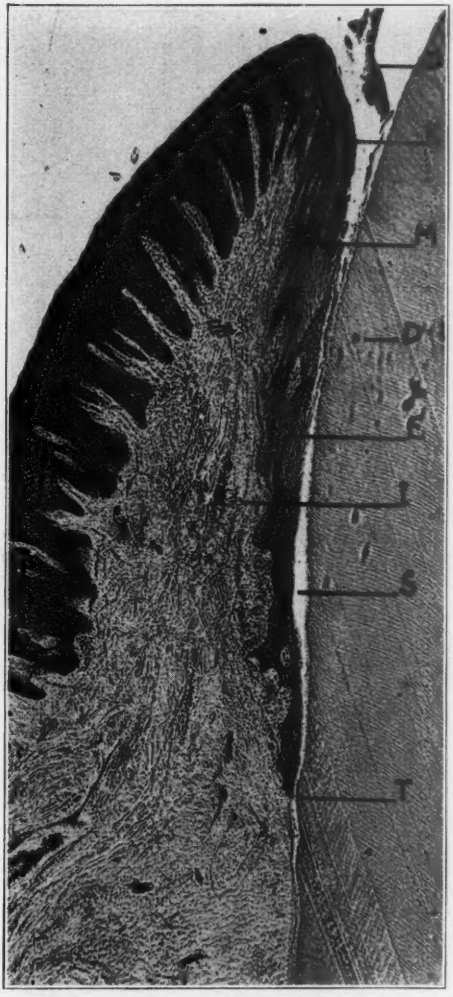

Fig. 9.—Abnormal labial gingiva of a monkey's tooth. *O*, calculus; *M*, proliferating mouth epithelium with a keratinized layer, *K*; *E*, epithelial attachment terminating at the cemento-enamel junction, *T* (pocket depth uncertain); *I*, slight infiltration and vascular endothelial proliferation; *D*, dentin; *S*, enamel space.

with von Ebner, that the gingivae contain lymphoid follicles ("tonsille gingivale") and, upon this foundation, constructs a picture of pyorrhea.

Other views might be mentioned, but they would not better the situation to any great extent. Such examples serve to show upon what a varied and ill-de-

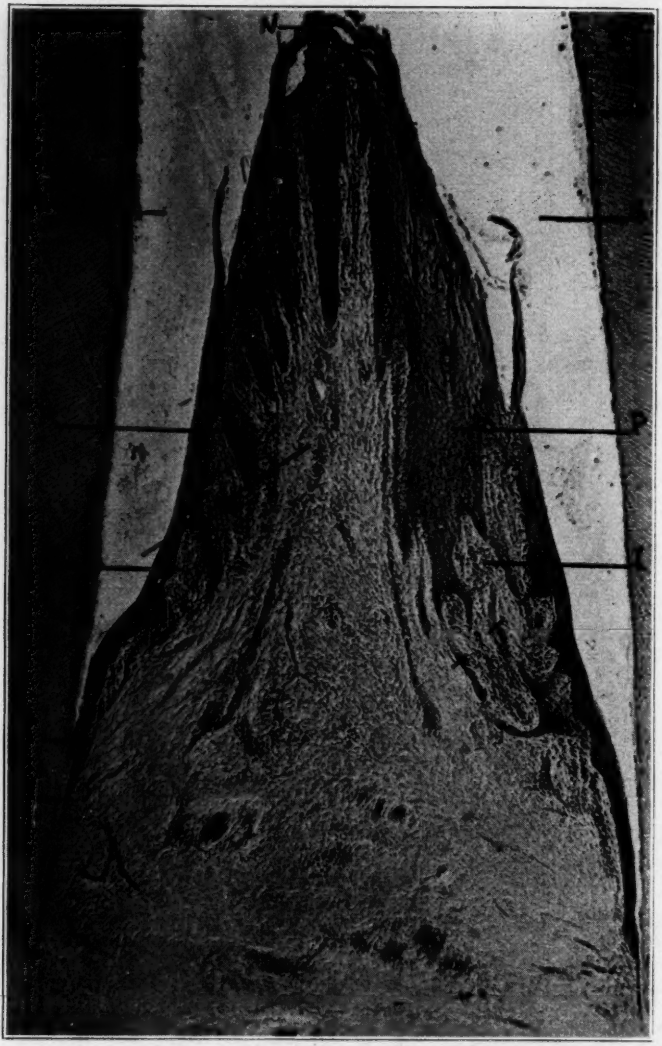

Fig. 10.—Abnormal interproximal gingiva of monkey—at least, a histologic gingivitis. *D*, dentin; *S*, enamel space; *N*, degenerating epithelium; *P*, proliferaton of the epithelial attachment, also along root of tooth 1, *T-T'*; *I*, inflammation and vascular changes; pocket depth uncertain.

fined basis attempts may have been made to learn the meaning of the many abnormal processes going on in the investing tissues of the tooth. Instead of the possibilities

Fig. 11.—Anatomic and physiologic normal buccal gingiva of the molar of a wild rat; also an "ideal" arrangement. *D*, dentin; *S*, enamel space; *E*, epithelial attachment grown along the root from *T*, the cemento-enamel junction, to *T'*; *V*, artefact; *M*, proliferating mouth epithelium covered by a keratinized layer, *K*. There is no pocket and no inflammation or injury.

that histologic and histopathologic methods may have been exhausted, it would seem rather that they have hardly been made use of. And even if we were to resort to experimental work for the purpose of seeking a solution of the problem of so-called pyorrhea, a step which has been suggested as now being necessary, it becomes quite a large question as to what results, what changes, should be looked for; what should be looked on as normal and what as abnormal.

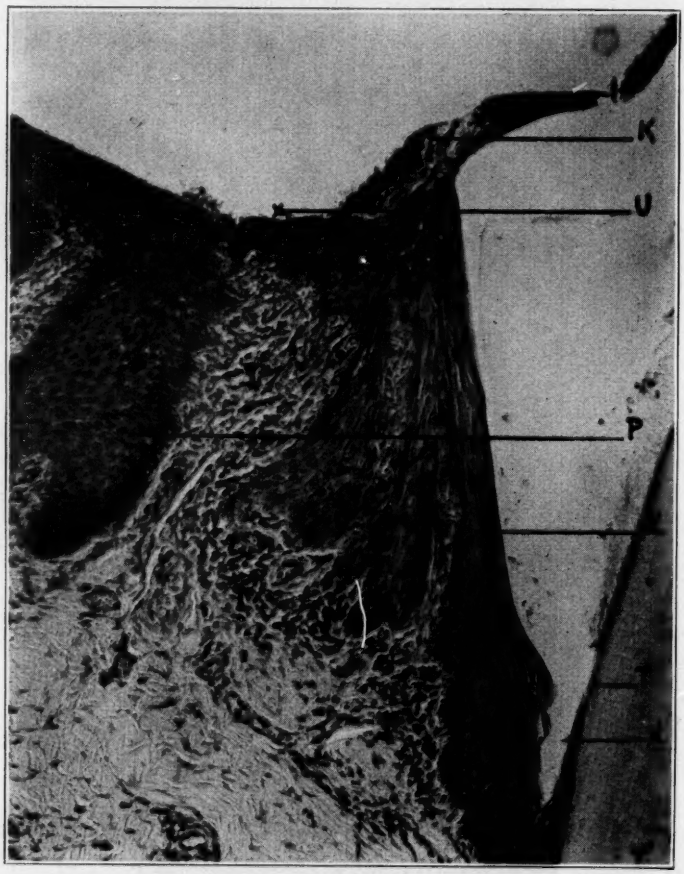

Fig. 12.—Abnormal lingual gingiva of an old dog. *K*, keratinized layer of mouth epithelium continuous with cuticle; *E*, epithelial attachment grown along root from *T*, the cemento-enamel junction, to *T'*; *U*, ulceration of mouth epithelium due to trauma, with proliferation of epithelium, *P*, and inflammation, *I*, the result; *X*, artefact. There is no pocket.

It seems quite possible that it is just this indefiniteness as to what should be

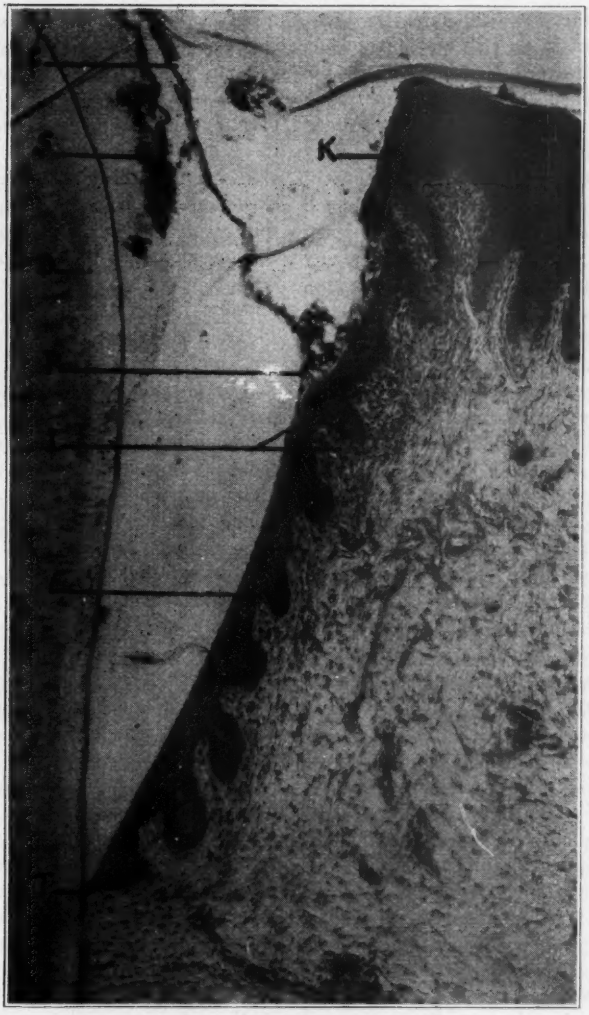

Fig. 13.—Abnormal gingiva of dog. *C*, cuticle; *P*, bottom of pocket occupied by organisms and degenerating cells; *E*, epithelial attachment terminating at cemento-enamel junction, *T*; *K*, keratinized mouth epithelium; *D*, dentin; *S*, carious enamel and enamel space; *I*, infiltration adjacent to pocket.

the basis on which to begin that has hampered and delayed us in determining the meaning of the abnormalities which occur. Over a century and a half has passed since the days of Fouchard and Bourdet, yet, apparently, we have made but little

progress either toward solving the problem of pyorrhea or in its treatment. It is true that the meaning of the term has been broadened somewhat, and that classifications have become more complicated; in some instances, indeed, they defy analysis. But alter the terms as we will, it does not particularly mean that much progress has been made. Such, at least, seems to be the case, for we are not seeing anything greatly different nor doing anything more exceptional than what was seen and done by others in the past.

Under these circumstances, it would appear to be time to consider other plans; to start afresh and from a different standpoint; and I am definitely taking the stand that that standpoint should be on the basis of as definite an anatomic and physiologic normal as it is possible to attain. What that normal picture is to be is far from clear. At the present time, there exists only a sort of a composite drawn up from many sources; and in that picture even, there occur features the status of which cannot be definitely defined as yet.

In its present state of indefiniteness, at least, the so-called physiologic picture (Figs. 2 and 3) does not appear to be a sound basis on which to build either from the histologic or the clinical standpoint. It verges too closely on the pathologic—indeed, it is difficult to take it for anything else than an abnormal picture, a histologic if not a clinical gingivitis or worse, about the cause or the outcome of which nothing is known. There appears to be no good explanation from a normal physiologic standpoint for many of the features associated with it. On the contrary, some of these at least, in the field of general pathology, would be considered as indications of abnormality.

The source of calculus, which is so frequently associated with this picture, is unknown. The cause of pocket formation, and the category into which it fits, are not clear. The subepithelial inflammation which is constantly present in this picture has not been explained. It seems to be directly related to the pocket and would seem to indicate quite clearly the existence of an irritation of some kind in that area. That proliferation of the epithelium along the root, although it does seem to occur in the absence of any observable abnormal cause (Figs. 5 and 11), can occur as a normal process is still uncertain.

The so-called "ideal" arrangement, in part at least, appears to be the nearest approach to a normal picture to be had today. (Figs. 1, 4 and 5.) As far as I know, it has not as yet been observed in human material—only in the animal has it been seen. This should not be taken to mean that it may not exist in the former; it perhaps only means that the type of human material which it has been possible to obtain is not suitable for a study of normality.

Certain features in this picture, features which appear to be more or less common, may be accepted with a feeling of some security as constituting in part a normal anatomic and normal physiologic gingiva. The epithelial attachment, the remains of the enamel organ, to all appearances, is attached to the enamel. There exists no pocket (crevice). This epithelial layer terminates at the cementoenamel junction and is relatively thin and usually nonpapillated. The mouth epithelium slowly grows downward behind the epithelial attachment, which brings about a considerable increase in the thickness of this tissue on this the tooth surface of the gingiva. The epithelial attachment thereupon atrophies, but remains in continuity with the tooth surface on the one side and with the proliferated mouth

epithelium on the other. Neither separation nor desquamation occurs. Above all, there exists no inflammation.

These things seem to be fairly a part of the normal picture, but there remain others yet to be settled. For instance, some question may be raised as to whether or not a reinforcement of the epithelial attachment by mouth epithelium occurs on the interproximal gingivae (Fig. 8). This change has not been so definitely demonstrated as taking place in the latter region as it has on other surfaces of the tooth; and, as has been indicated, the meaning and status of epithelial proliferation along the root is still an open question.

Some variations also occur in this picture which have yet to be explained. For instance, it has been shown that the keratinized layer of the mouth epithelium may overlap the cuticle (Fig. 1, 4 and 5). It has also been shown that the proliferating mouth epithelium may become keratinized (Figs. 5, 6, 9, 11 and 13). Such added modifications of the elements making up the gingivae may be looked on as ideal from the standpoint of immunity; but sometimes this keratinization does not develop (Fig. 7), and the question arises as to whether this is to be considered normal or already an indication of abnormality. Certainly it does not appear to be ideal. Other exceptions also occur, and further study may bring to light still more to determine the status of which may require considerable effort.

We may see, then, that only a sort of a skeleton of a tentative anatomic and physiologic normal exists, and that a great deal more study will be required for its completion. It was said a long time ago (Virchow) that it is difficult, if not impossible, to draw a sharp line between the normal and the abnormal. However true that may be, I cannot concede that no attempt should be made, and neither can I concede that it is not important, else this objection to the situation which now exists would not have been voiced. As I see it, it may well be that the solution of the major problem hinges on a solution of just such seemingly minor things as exist as differences in the normal; in other words, in the establishment of as complete a normal picture as is possible. And I cannot see that it is at all possible to make clear the abnormal without coming to some definite understanding as to what should constitute the normal, with which it may be compared.[14]

14. Since the preparation of this article there has appeared a discussion by Gottlieb (Fortschr. d. Zahnheilk., May, 1930, p. 350) of the epithelial arrangement and pocket formation which, in part, coincides with and in part criticizes Becks' views.

WHAT ARE PROPER FEES FOR THE AVERAGE DENTIST?*

By HENRY A. HONOROFF, D.D.S., Chicago, Ill.

THE term "average dentist" is too often used rather vaguely and loosely, and since I shall employ it from time to time as describing a certain definite individual, or a group of individuals, an effort will be made toward a clear understanding as to the meaning of this term.

Because of the complex human factors that must necessarily enter into the ethical practice of dentistry, it would be impossible to point out certain groups of dentists, and classify them as superior, average or inferior, in accordance with the discharge of their professional obligations to their patients and with their ability to carry out the necessary technical procedures. It is all too obvious, and the instances are too numerous to require any proof further than the contention that many of the so-called wizards and supermen of the profession are very often not up to par, either in their ability or the desire to do the proper thing by their patients. On the other hand, it has been amply demonstrated that some of the finest dental operations and the most laudable self-sacrificing performances for the benefit of dental patients have come from dentists of a very humble and unassuming type, whose names nearly always remain in obscurity.

The average dentist, then, should be looked on and accepted not as a dental practitioner of average ability, or of ability below the grade of those who are considered or wish to be considered as of high standing. Rather, he should be judged by the caliber and social standing of his patients. He is an average dentist who conscientiously, and to the best of his ability, ministers to the dental needs of the average citizen, of average means and of average requirements. The "average dentist" can be considered only as here defined in the attempt to arrive at a certain figure which may be looked on as his proper fee. All observations and conclusions in connection with the gaging of this fee can be based only upon the social standing and material needs of the average dentist. It is only these two conditions, and not his professional standing, that make it necessary for the dentist to accept cash payment for his service.

As a member of modern society, the average dentist cannot consider himself an exception to the rest of the community in which he lives and carries on his work. He is not immune to the needs and obligations which affect the social structure surrounding him, and he is subject to all economic rules and regulations which are imposed on all average citizens. He is required to pay rent and taxes. He must pay for food, clothing, light, power, labor and materials in the same manner as

*Read before the Section on Dental Economics at the Midwinter Clinic of the Chicago Dental Society, Feb. 3, 1931.

the rest of the community; and he therefore must purpose to receive as remuneration for his efforts, along with the satisfaction that comes from giving good professional service, a material reward which will enable him to meet his obligations honorably.

The pleasure that comes to the dentist from the realization that he has served well and from the gratitude of his patients who are made happier through his service is not only the impelling force which inspires him to do his work well but also the spiritual reward for the many sacrifices which he must make in the conscientious performance of his professional duties. This feeling of pleasure, although essentially a reward, cannot be governed by economic formulas, cannot be evaluated in a pecuniary sense, and no attempt shall be made here to set a price on it.

One must be imbued with certain ideals and aspirations before one can undertake the proper practice of dentistry. Indeed, the situation would be ideal if the dentist could give himself entirely to serving humanity in his especial capacity without ever having to think of material compensation.

This ideal condition has not yet arrived. The average dentist still finds himself in a world which is materialistic, sophisticated and hard-boiled, and in order to facilitate the proper functioning of his professional body and mind, he must arm himself from head to foot with protective elements. His resistance can be much strengthened by the injection of large doses of economic principles into his system.

Society is expecting the dentist to fulfil his mission in life. It expects him to relieve pain, prevent disease and cure the afflictions which verily endanger lives, but it also demands, in no uncertain terms, that he pay his bills. If he does not satisfy demands for payment, this human benefactor is unceremoniously dealt with by the same society for whom he works so hard, and whose health and welfare are his constant concern. These objects of his professional devotion will shut off his water and gas supply. They will disconnect his telephone and shut off his light. They will even put him out in the street, and take his home away, should he dare not to pay his bills.

With all these dangers threatening him, the dentist cannot loosen himself from the iron grip of material demands and circumstances. He is forced to abandon his ideas of pure missionary service, and he must mix business with his profession. The rôle of business man is forced on him by society, and contrary to professional traditions, he must assume the position of salesman, and consider his patients as customers in connection with the practice of his profession. In the same light, the dentist must consider himself an employe, and his patients have to be viewed as his employers.

So, whether he likes it or not, the average dentist is doctor, salesman and laborer all in one, and in his daily life he must conduct himself in a manner that will satisfy all who have placed him in these three categories of human endeavor. He must adjust himself to conditions as they are. He must be able to solve his worldly dilemmas in a practical way.

Granting that his service is satisfactory, his patients, having paid him what he himself has designated as a fee for that service, are justified in thinking that the dentist has been fully rewarded, and they have a right to expect him to be able to meet his financial obligations to them. Why, then, is it that many dentists are unable to pay their bills? Why is it, then, that, according to the best infor-

mation obtainable, the net yearly income of the average dentist in the United States is less than $4,000? Why is it that 50 per cent of the dental profession are delinquent in paying their dental supply bills?

The fault certainly is not with the public. They are paying the dentist what he is asking them to pay, and their obligations to him are apparently discharged honorably. From this, it follows that the fee, or the financial award, set by the dentist himself for his work has been inadequate and insufficient to cover his necessary expenditures.

The dentist, then, must look upon himself as the cause of his financial troubles, and he must make a thorough search within the realms of his own being, and the confines of his own practice to find out what he himself does that is placing him in an economic predicament. He must, first of all, familiarize himself with the various factors and principles that govern and determine compensation for professional service. He, also, must conduct his office and practice is strict accord with those principles.

As has been pointed out, the average dentist is not only a wage earner, but also the head of a business institution, and as such he is entitled, as economists recognize, to a return purely from the sale of his product.

The allotment of his fee, then, should be governed not alone by his necessities, comforts and luxuries, which are the main forces in the determination of a laborer's wage. In the distribution of its wealth, society must allow a share for the average dentist which is large enough to provide for all the three factors mentioned, and also to cover all expenses incidental to the running of a dental office, including interest on capital invested, depreciation and some net profit. This net profit must be ample enough, when set aside for that purpose, to provide a fair income for the dentist in his declining years, when he is no longer able to work. This portion of the public wealth so allotted to the dentist may be termed as his fee.

This sort of fee, to be considered proper, does not necessarily have to be too high, but it must be sufficient. Such a fee is healthful for both patient and dentist. A low fee makes it prohibitive for the dentist to do good work and a high fee makes it prohibitive for the average patient to have good work done. In this respect, fees exert the same influence on dental service as do wages on labor, and economic laws that are applicable to labor are also applicable to dental service. Both dentist and laborer are human, and they are governed equally by the dictates of human nature.

Prof. Richard T. Ely, of the department of political economy of the University of Wisconsin, points out very vividly the favorable effect that good wages have on efficiency in labor. He says, among other things:

> Even from the standpoint of employers as a class, the policy of depressing of the laborers' standard of life stands condemned. More and more businessmen are coming to learn the "economy of high wages," and that "cheap labor is dear labor." American labor is in many industries the cheapest labor in the world, because it is the best paid. High wages make possible a high standard of life. The high standard of life makes the laborer intelligent, hopeful and full of character, as well as more efficient physically. The increased efficiency makes possible the higher wages. Thus, by action and reaction the standard of life is both a cause and result of wages received.

It is plain, then, that in order for the dentist to give himself wholeheartedly to his work, he must be paid for it in such measure that he will not be kept in constant want. The dentist who earns a

mere starvation income by the practice of his profession cannot be much enthused over dentistry, and where there is no enthusiasm, there can be no good work. Lack of enthusiasm leads to a gradual dislike for the profession, which is followed by resentment on the part of the dentist toward good work. The inevitable result is bitter disappointment to the dentist and to his friends.

As has been shown, his fees have a tremendous influence on the life and behavior of the dentist, and therefore their determination cannot be taken too lightly by him. Still, a study of dental fees as they are today shows definitely that thousands of dentists are not giving this matter any thought at all, and resort mostly to guesswork and trust to luck in setting a fee for their work.

In looking through the many lists of prices for dental work that have been gathered by investigators for various dental organizations and publications in the past two or three years, one glimpses a tragic picture. These figures tell a sad story of how thousands of intelligent, well-intentioned and industrious people engaged in the practice of dentistry are daily committing economic suicide. They tell of inverse proportions between service and fees, they show vividly the inconsistencies and lack of application of simple logic on the part of a great majority of dentists to the matter of estimating costs of dental service. These figures leave nothing to the imagination as to the many sacrifices and self-denials that these grossly underpaid dentists have to contend with as a result of their own mismanagement.

There is no good reason that there should be a state of constant economic depression in the ranks of the dental profession. Most patients pay their bills as estimated and required by the dentist. The fact that the dentist underestimates his own services and presents an insufficient bill is entirely unknown to them. As a matter of fact, many patients would consider it a personal insult to learn that their dentist had been giving them charity.

It is plainly the business of the dentist to be able to present the right kind of a bill for his services. But so far, the dentist has been slow in acquiring knowledge in this respect. Instead, he has acquired a lot of bad habits that are undermining his financial structure.

Quite unnecessarily, and much too often, many dentists play the rôle of "big brother" and "good fellow" in the wrong place, and confer uncalled for philanthropies.

Even the best informed dentists can recall more than one instance in their own practices in which the showering of professional charity on patients has been accepted by the patients with wonderment as to the soundness of the doctor's mind.

Chief among the bad habits of the dentist leading to his financial plight is his indulgence in "throwing in" things with his work as a bonus.

One wonders if any dentist can walk into a merchandise store, purchase a hat and have a pair of shoes "thrown in" with the bargain. The very thought of it would be absurd. Yet, many dentists will think nothing at all of "throwing in" a prophylaxis with each operation they undertake, be that operation as small as the placing of two amalgam fillings. Many will undertake the construction of a rubber denture for a certain fee, and will unhesitatingly "throw in" all the extractions that may be required in connection with that particular case, without any additional charge. Still others will "throw in" all necessary treatments for

the fee which they are accustomed to charge for the filling or crown that the treated tooth may require.

Poor judgment, undervaluation of their services and guesswork are also largely responsible for the financial downfall of many dentists. This is perhaps best illustrated by a story told by a past president of the Chicago Dental Society of how a colleague of his made a trip to his office in the Chicago loop district from his suburban home on Sunday morning, and after spending the whole morning in relieving the pain from an incipient alveolar abscess for a millionaire's little son, nearly knocked the boy's father off his feet when he named his fee. "What do I owe you, Doctor?" asked the patient's father. "I appreciate greatly the fact that you put yourself out for me, and I see you have worked very hard." "Well," said the doctor, hesitatingly, after some deliberation, "I guess $2 will do." This man sold four hours of his time and $2 worth of railway tickets for the sum of $2, besides spoiling the holiday for himself and a friend with whom he had an appointment to play a round of golf that morning.

Such poor logic as was used by this dentist in the fixing of his fee and similar demonstrations of undercharging by other dentists are not only detrimental to the earning power of the profession, but what is much worse than that, they tend to belittle dental service in the eyes of the laity. Here and there, a case of disproportion can be observed, when the dentist has put too high a value on his services, or has received large sums of money for very little service. These men are, of course, the exception, and aside from mentioning that there is no room in the ethical practice of dentistry for exorbitant fees and that extortion is not a virtue in the professional man, the discussion of the matter can be abandoned with a feeling of gratification that extortionists and quacks are only in a small minority. Their methods and fees should have no influence whatever on the average dentist.

All of the undesirable traits of the average dentist mentioned are to be considered as contributory causes of diminished income and microscopic fees.

The main underlying cause for inadequate dental fees is to be found in the lack of knowledge on the part of the average dentist of the actual cost to him of the various types of restorations, operations and services for which he is called on in his daily practice.

All available figures, whether obtained from current dental publications, from statistics gathered by bureaus of dental economics or from piles of data gathered by the dental supply houses, point to one thing, and that is that the average dentist has a net annual income of less than $4,000. This figure being an average, it follows, naturally, that there are still thousands of dentists whose net annual income is less than $3,000. If that is true, the fees charged by thousands of dentists, as shown in many of the dental magazines, are correct. It must be true, then, that thousands of dentists are making a charge of $2 for a one-surface amalgam filling, and $3 for two surface amalgam fillings. These low fees are prima facie evidence that the dentists making those charges have absolutely no idea as to what those fillings cost them. The fact that thousands of dentists are making one-surface gold inlays for a fee ranging between $5 and $10 and two-surface gold inlays for a fee ranging between $7 and $12 is more evidence of the utter disregard for the cost of these restorations to the dentist.

Even those dentists who report fairly good incomes show a great need of better

understanding of the basic economic principles affecting their fees.

Perhaps the most authoritative and authentic figures along the lines of fees charged, gross incomes and expenses are to be found in the preliminary report issued by Northwestern University Dental School Bureau of Economics, of a survey for 1929. This survey is very valuable. It reached out to all states and gathered data from Northwestern alumni who have been in active practice for from one to thirty or more years. The majority of data given in this report were obtained from dentists practicing in cities that have a population of from 10,000 to 500,000 or more. The figures appearing in the survey were submitted only by one-third of the dentists who received questionnaires. These figures show only large incomes, which makes it apparent that they were given out by successful practitioners, who are well paid and whose offices are conducted most efficiently. The figures could be considered average incomes had the other two-thirds of the alumni sent in their reports. But those who do not bother answering questionnaires are, generally, men who either have to guess at figures or whose incomes are so poor that they are shy to disclose their identity.

Naturally, the average annual net income of $5,480 earned by one-third of Northwestern alumni cannot be considered as a typical net annual income of the average dentist. This figure would no doubt be brought down to less than $4,000 had the men receiving the low fees reported their actual incomes to the bureau. The report of the bureau is highly significant because it brings out the following facts: 1. The best paid men in the country earn less than $6,000 a year net on the average. 2. The most efficient men in the country show a maximum of 1,200 productive hours a year. 3. The gross expense of the most efficient dental offices is about 35 per cent of the gross income. 4. In order to earn $6,000 a year, putting in the maximum number of hours humanly possible to work by a dentist, which is 1,200 hours, he must receive a fee of not less than $8 an hour. 5. The uniform standard of life of those dentists as reflected by the uniformity of their fees can be accepted as the standard of life of all average dentists.

Considering the social environment of the dentist, it is to be observed that he cannot live any too extravagantly on $500 a month, and no dentist need fear that his fees are too excessive if he sets out to earn $500 a month. At a minimum, the average dentist has only 1,000 gainful hours a year, and the office expense of the average dentist is 40 per cent of his gross income. To arrive at a fee of $6 net an hour, the average dentist must charge $10 gross an hour.

One must take into consideration the fact that the number of years of a dentist's maximum production are very few. It takes some years before one attains maximum production, and having reached the top of his ability to produce, one must reckon with the physical impossibility to maintain top speed indefinitely. The number of active years that the average dentist has for the practice of his profession can be divided into three periods. The first are the years given to the building up of his practice; the second, the years during which the zenith of his professional achievement has been reached; the third is made up of those years during which his practice must assume a downgrade course. It is clear, then, that the period of maximum production must give the dentist a revenue which should be ample to make up for the insufficient income of

the years previous to and following those of maximum productivity. Since he has only a very short time in which he can receive full financial reward for his professional efforts, the dentist cannot afford to waste that time. He must use it sparingly and judiciously as something very precious, as the only thing on which depend his own happiness and the happiness of his family. He must learn the actual value of his time in dollars and cents, and he must learn to apply that time value to the cost of the various procedures, operations and restorations for which he is called on in his daily practice.

To express this in terms of business: Patients come to the dentist to buy fillings, crowns, inlays, plates, bridges, etc. The dentist, who sells those things, must know their exact cost. Lacking in the knowledge of cost, he cannot sell his commodity rightly. He is apt to charge either too much or too little, doing an injustice either to himself or to his patients.

It so happens that most dental operations and procedures are of a character that allows of a certain definite amount of time to be apportioned to each one of them. They can practically all be measured in time units, which makes it possible to affix to them a certain definite financial value. All that one has to do is to make use of the simplest form of record keeping and the simplest rules of arithmetic. Having made a hundred one-surface amalgam fillings, and having kept strict record of the time taken up by these fillings, the dentist can find out for himself the average length of time that he spent in the making of an amalgam filling, by dividing the total number of hours by the number of fillings. The same method can be applied to the gold inlay, to the various types of crowns, to treatments, to synthetic porcelain fillings, etc. Having determined the average length of time required by each operation, the dentist must next make it his business to find out the cost to him of that time in actual cash. This he can do by dividing the total annual office expense by the number of hours he actually works at the chair and in the laboratory. For example, if he works the maximum of 1,200 hours a year and his gross office expense is $3,600, each working hour has a cost value of $3. This cost per hour, by the way, is applicable to all average dental offices. The dentist who only works 1,000 hours and has a gross expense of $3,000 is also paying $3 an hour for the privilege of practicing dentistry. Applying this time value to the simple occlusal amalgam filling, one can easily arrive at the cost to him of that operation. From statistics compiled by me, it can be said with a fair degree of exactness that, on the average, it takes twenty-five minutes to make a simple occlusal amalgam filling, using proper methods of cavity preparation and including polishing. Since the lowest cost to the average dentist of doing business is $3 an hour, twenty-five minutes of his time costs the average dentist $1.25. Adding the cost of material, which is 15 cents, to the time value, it is established that the simple occlusal amalgam filling costs the dentist $1.40. The dentist who sells these fillings at $2 is getting a fee of 60 cents for twenty-five minutes, or $1.40 an hour. If he were to make nothing but simple occlusal amalgam fillings all the year round at that rate, he would have a maximum annual net income of $1,680, or $35 a week, which, of course, is a very poor wage for a professional man. At $3 for each simple occlusal amalgam filling, the net fee for each hour would be $3.84 and the maximum net annual income would be $4,608. At $4 for each simple occlusal amalgam filling, the net fee for each hour would

be $6.24, which is about the right fee for the average dentist.

The actual cost to the dentist of the gold inlay is established in this manner. It takes on the average one and three-quarters hours to produce a gold inlay, using proper cavity preparation, impression taking, casting, polishing and setting. This time has a cost value to the dentist of $5.25, the material used has a value of $1. In all, the gold inlay has a cost value to the dentist of $6.25, on the average. The dentist who makes gold inlays at $5 is giving his labor for nothing, and besides he is paying his patients $1.25 in cash as a bonus for being allowed to practice his art in the mouths of those patients. The dentist who makes gold inlays for $6.25 is just working for nothing, but is not giving his patients any "pocket money." Those men who make gold inlays at $10, and there are many in this class, are earning a net profit of $3.75 for each inlay, or $2 an hour, and those who get $15 for each gold inlay are making about $5 an hour net. To make a net profit of $6 an hour on gold inlays, one has to charge $16.75 for the average inlay.

It is peculiar but true that the men who manage to get $3 for each simple occlusal amalgam filling, thus earning close to $4 an hour net, are selling gold inlays at $10 or less, prices which bring them only $2 an hour or even less. It is logical to expect that a gold inlay restoration, which requires finer taste and better skill, and more intense application of the operator's resourcefulness, should command a better fee than does the simple amalgam filling; still, the time consumed by the gold inlay is sold by the majority of the profession for a half of the price that they are getting for the time used up by the amalgam filling.

This condition can be attributed only to the fact that most dentists do not know the value of the inlay. They seem to base their charges only on the cost of material, forgetting the cost of time.

Gold crowns take about the same amount of time and materials as inlays, and the fee for gold crowns should be the same as the fee for inlays. Three-quarter crowns take two hours, and $1.50 worth of materials, and the fee for them should be figured on this basis. Porcelain jacket crowns take two hours plus laboratory charge. Detachable post crowns take one hour and thirty minutes plus cost of material. Devitalization and root canal fillings take one and one-half hours for anterior teeth and two and one-half hours for posterior teeth. This should be remembered particularly by those who do not charge for treatments. A fee of $10 for devitalization and root canal fillings of anterior teeth and $15 for posterior teeth is the minimum that a dentist can charge.

Synthetic porcelain fillings take about the same time as simple amalgams, and should be charged for in the same proportion as simple amalgams.

The average cleaning of teeth takes twenty-five minutes, and the time value is the same here as it is for simple amalgam fillings. The average extraction, under a local anesthetic, takes fifteen minutes, and the minimum fee for that should be $2. Extractions cannot be sold only on the basis of time consumed. This being a surgical operation in which the operator often assumes a great responsibility, the fee must be commensurate with the seriousness of the case. Nevertheless, good judgment must be used, and exorbitance must be avoided in establishing the fee for this type of work.

The average cement base takes twenty minutes and the minimum fee that can be charged for a base is $2.75. All treat-

ments, such as sealing in remedies for relief of toothache, packing and irrigation, take fifteen minutes on the average. A charge of $2 for each such treatment should be made.

The fees just discussed here have been calculated to fit the operations most commonly performed by the general practitioner of dentistry. They are based upon the value of time and material plus the dentist's living wage. While the figures quoted are perhaps not universally identical, they may still be used as a guide for making estimates by the average practitioner, because the variations that might be ascribed to geographic location and personal adeptness of different dentists are too small to be of any significance. Besides, there is always room for using discretion in dentistry. It may sometimes be necessary to give away certain things at cost, or below cost, but with a definite knowledge as to the value of the gift, one is in a position to give knowingly and for a purpose, rather than unknowingly and purposelessly.

Bridgework and plates bring the highest revenue to the general practitioner of dentistry. To use Boyd S. Gardner's expression, "they make bread and butter for the dentist," and this presentation could not be considered complete without an analysis of this phase of dental practice and its fees.

With regard to quoting of fees for this type of work, there is one particularly cherished idea of the average dentist that he must forever abandon. This idea is erroneous and impractical—it can even be considered a violation of professional ethics, although the practice of it has been followed by the finest and most ethical dentists. These dentists entertain the notion that the deficiency in their incomes created by low fees received for operative dentistry can be made up on bridgework and plates. If the idea of making one class of patients pay for the other can be justified from the standpoint of professional ethics, would it not be better ethics to make the operative patients pay for the prosthetic patients? Patients requiring operative dentistry such as fillings, inlays and treatments are generally young people in good health, self-dependent and able to pay. The nature of the dental work that they require is very beneficial to them, for it tends to preserve their natural organs of mastication. It is the hardest and most exacting branch of dental practice, often demanding the operator's utmost physical and nervous exertion. Patients requiring plates and bridges are generally old people, depending on someone for their mere existence. The nature of the dental restorations that they require cannot be compared in usefulness to that of the restored natural teeth of the younger patients.

Although the dentist does not have to exert himself nearly so much in the construction of dentures or removable bridgework as he does in operative procedures, it is an almost universally accepted axiom, as far as the dental profession is concerned, that artificial restorations have a higher pecuniary value than operative work, and it is expected that the small percentage of patients in need of artificial restorations pay the bill of the very large number of patients in need of fillings and treatments.

An actual count of hours spent on the various operations and procedures in the average dental office shows definitely and conclusively that the high fees received for prosthetic restorations do not make up for the low fees received for fillings and treatments, and whether the idea of making up the losses sustained on one class of patients by overcharging another class of patients is ethical or not, it cer-

tainly is a blunder from the standpoint of economics.

An inventory of dental operations performed by me throughout each year for the past six years reveals the fact that 75 per cent of the operator's time is spent on operative work, and only 25 per cent of his time is spent on prosthetic work.

The average dentist distributes his 1,000 working hours in the proportion shown in the accompanying tabulation.

DISTRIBUTION OF WORKING HOURS (1,000)

	Operations	Hours a year	Per Cent
285	amalgam fillings	115	11.5
300	synthetic porcelain fillings	100	10.0
120	gold inlays and fillings	200	20.0
100	copper cement fillings	33	3.3
500	treatments	120	12.0
200	prophylaxes	75	7.5
175	extractions	42	4.2
	Made-over fillings	5	0.5
90	copper cement bases	30	3.0
300	roentgenograms	20	2.0

In all, he spends about 750 hours in fillings, treatments and extractions of teeth, and only about 250 hours in the making and insertion of plates, crowns and bridgework.

In most cases, the dentist who is accustomed to receive very low fees for operative work is also receiving proportionally low fees for plates and bridges, thus automatically shutting himself off from the opportunity of making up his losses. But granting that he does receive a fair price for bridges and plates, which is about $15 an hour gross, according to all available information as to the best average fee for this type of work, will this additional income of the 250 hours make up for the loss incurred by underselling the 750 hours?

Taking $10 as the minimum gross value of a dentist's productive hour, which is about the correct value, and assuming that he charges only $5 an hour gross for his operative work, he loses $3,750 on the 750 hours of this type of work a year. The 250 hours of prosthetic work at $15 an hour would bring him an additional profit of $1,250 a year. Deducting the $1,250 profit from the $3,750 of loss, he still has a loss of $2,500 a year which was not offset by the additional $1,250 realized from bridges and plates.

The approximate loss to the dental profession of this country from insufficiency of fees is close to $150,000,000 a year.

By making a proper charge for operative work, the dentist will preclude the necessity of making an excessive charge for prosthetic work, thus doing the right thing by both classes of his patients and also by himself.

In justice to the average dentist, it must be said that he actually is not overstepping the boundaries of the code of ethics by getting a better fee per hour for prosthetic work. What little additional income he does get from bridge and plate work does not accrue from overcharging on this work. The larger revenue here is really the result of economy in time made possible by the employment of outside labor.

By delegating the dental technician to do a large portion of this work for him, the dentist is enabled to finish these cases in a comparatively short time. Were he to do all of his laboratory work himself, the fee for this class of work would not be big at all, as it would necessarily be spread out over many more hours than it now is.

The fact that the deficit created by underselling 75 per cent of his time cannot be absorbed by the proper fees received by the dentist for 25 per cent of his time cannot be emphasized any too strongly. The average dentist must dis-

pel all illusions as to the possibility of counterbalancing operative losses by prosthetic gains. The only proper way to stop the losses on operative dentistry is not to incur them. Let the fees for prosthetic appliances stand where they are, and let the 75 per cent of patients who need operative work pay for this work in a measure that will not create any deficit.

CONCLUSION

It should be repeated that the item of cost can easily be arrived at by the use of the simplest methods of accounting. It must always be remembered that every hour spent in the office on patients whether it be in stopping a toothache, taking impressions or soldering a bridge, has a definite cost, and that these hours must be sold at a profit. It is on the knowledge of the exact cost to him of each and every dental operation that the success of the dentist depends, and not until the average dentist takes the trouble to find out that cost will he be able to extricate himself from his financial difficulties.

This knowledge will change the whole psychologic aspect of the dentist. It will cure him of a chronic inferiority complex, which was brought on by the constant uncertainty of his ground in the matter of fixing of his fees. His physiognomy will be rid of blushing, and guessing will become foreign to his makeup. He will begin to make charges for his work intelligently. He will stop "throwing" things in, and he will be placed in a position enabling him to name his fees with a certainty of manner that commands confidence and respect. He will at once find out which operations do not pay, and he naturally will put them on a paying basis. His fees will become uniform and in direct proportion to his service. All of his patients will receive not only ethical professional treatment, but also ethical business treatment. His income will be increased, not because of overvaluation of services, but because of stopping unnecessary extravagance in the dispensation of time, and because of receiving a fee which is adequate and properly due him.

SCIENTIFIC AND RATIONAL THERAPEUTICS: ITS EFFECT ON DENTAL PROGRESS*

By P. J. HANZLIK, M.D., San Francisco, Calif.

THE subject, which has been assigned to me, "Scientific and Rational Therapeutics: Its Effect on Dental Progress," implies that there is another kind of therapeutics which is neither scientific nor rational and may have undesirable influences. It is known that the treatment of disease is frequently disposed of with a peculiar species of indifference and carelessness and that there is a large body of remedies of doubtful value whose use is inconsistent with accepted scientific principles. This is not surprising when one considers that the

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*The papers of Drs. Hanzlik, Smith and Palmer were presented as a symposium on "Nostrums and Proprietary Remedies in Dentistry."

rigid criteria which may be, and generally are, applied in the diagnosis of disease are not utilized in determining the choice and value of remedies. Instead, the decision may be made according to undiscriminating authority, or from untested impression or opinion, a procedure which may be anything but scientific.

These matters can be illustrated by incidents which occur repeatedly in clinics, hospitals and private practice and are frequently described in the literature. A short time ago, an incident occurred which recapitulated some experiences of mine twenty years ago, and which, I believe, illustrates a fundamental reason for irregularities in the practice of therapeutics. Last summer, in a clinic on a blood disorder, given by an outstanding internist before a large audience of students and practitioners, fifty of the fifty-five minutes was spent on discussing routine diagnostic details and several theories of blood coagulation. During the last five minutes of the period, an imposing list of remedies for anemia was enumerated without reasons for their mention, or a word on theories as to their actions. The therapeutics lacked the judiciousness and the impressive evidence which the clinician was at great pains to give in making the diagnosis of the disease, but there was no lack of information on drugs which could have been profitably discussed. It is disconcerting to see a lack of balance between the emphasis on the recognition and cause of disease and on its alleviation, because therapeutics is the great aim of medical science, which every practitioner endeavors to fulfil, and every patient has a right to expect.

There are some teachers and clinicians, and possibly some practitioners, who are critical to the point of doubting the usefulness of nearly all therapeutic agents. These are extremists who are likely to stimulate the use of drugs of doubtful value, to encourage the cultists and the antis, and to create prejudices against the fruits of scientific experimentation. It appears quite as illogical to stop with the diagnosis as to treat without it. The ideal is to diagnose correctly and treat rationally.

As the result of careless statements, thoughtless endorsements and dogmatic or nihilistic views on therapeutic agents, expressed by those in positions of responsibility and leadership, practitioners frequently find themselves in a dilemma, trying this remedy or that, acting now on the opinion of one authority and then on another, and inevitably carrying on the crudest form of experimentation conceivable. The elementary principles of systematic trial and logic are forgotten and the variabilities of biologic phenomena are overlooked. Common sense and judgment are suspended; professional standing and the patient's welfare are disregarded. Personal impression and opinion are invoked without knowledge as to whether the experiences are real or false. The value of objective evidence in lieu of personal impression or opinion may even be denied. If the patient survives, the chief result attained with this kind of therapeutics is a demonstration of the patient's resistance to intervention by foreign agents.

Doubtless the element of credulity in human nature is a large factor in the cause of carelessness and indifference here. Emotions are appealed to and desires motivated by the word of authority, by a claim stoutly made, by a spectacular or fantastic performance or by a promise of success. However, credulity is the child of ignorance and is inexcusable in view of the demonstrated success of the scientific method of investigation, which will yield a critical and dependable result.

It is still argued that therapeutics is an art which must be learned on the patient, or at the bedside, and that nothing need be accepted which is derived from scientific or laboratory experimentation. But nothing is farther from the mysterious and intangible than the way in which this art is supposed to be acquired. Those who argue in this way indeed overlook that all real art rests on the appreciation of scientific principles. Otherwise, the products of art would reflect the falsehoods and unrealities of an unchecked imagination. Thus, the art, and the science, of therapeutics in the best sense are mutually interdependent and rest on exactly the same basis. Since every patient is a problem for investigation, there is every reason to believe that the therapeutist with definite knowledge of the patient's condition, and of the possibilities and limitations of the remedy, can succeed in a scientifically artful way of achieving a result, satisfactory to himself and to his patient, and with the faith that he has complied with the operation of natural laws which he cannot avoid. Therefore, there is only one kind of therapeutics which is justifiable, and that is the rational and scientific.

What may be expected of a therapeutics which acts in definite terms of the remedy and conforms to the operation of laws controlling biologic phenomena in disease? Briefly, the answer is accuracy, dependability, safety, justice and success. The converse of all this is to be laid at the door of guesswork and ignorance. Let me justify the answer by developing and amplifying a number of considerations.

The rational treatment of disease presupposes a knowledge of its history, recognition and cause, and a thorough appreciation of the tendency to spontaneous or natural recovery. All that is necessary, then, is to remove the cause, and recovery will follow without medication. Old, simple and elementary as this truism is, it is nevertheless frequently overlooked or violated. Before the recovery from disease can properly be attributed to a remedy, the factor of spontaneous recovery must be eliminated, a matter which can be simply achieved by making a blank test, i. e., awaiting recovery without treatment. Frequently, several remedies are given successively, and the result is ascribed to the last one that was given, though this may have been quite innocent, superfluous and unnecessary.

If the medicament can remove the cause, this is naturally the most rational procedure, but this is not the case with most remedies, which may, nevertheless, exert benefits by ameliorating or controlling symptoms. Such remedies may assist in general recovery, promote the natural defenses or permit the employment of other methods of treatment which, without them, would be impossible, such as the use of anesthetics in surgery. The choice and evaluation of these remedies offer greater difficulties and dangers of misinterpretation. The rational use of every remedy, whether etiologic or symptomatic, must nevertheless depend on a thorough knowledge of its actions, its limitations and possibilities. These can only be ascertained from a complete and systematic study of its pharmacology and from controlled clinical trials.

The complete pharmacologic investigation of a remedy requires a knowledge of its chemical composition and identity, its physical and chemical properties, stability, form for administration, etc. Frequently, it is possible to make a preliminary estimate of the promise of a drug from these general properties, a matter well illustrated by the large group of barbitals (veronal; luminal) since, from the similarity in composition and properties,

an understanding of a single member gives a fair idea of all the rest except for quantitative differences. This is preliminary to an accurate description and analysis of the effects of the drug on physiologic functions, in order to determine the manner in which the changes are brought about. The changes manifest deviations from the normal state, for drugs act merely by altering existing functions, i. e., increasing, decreasing or abolishing them, but not creating new ones. The details concern themselves with determinations of the symptoms and their mechanism, the absorption, distribution, fate, excretion, toxicity and its treatment, dosage of the drug, etc. Then comes the determination of its effect in experimental disease when possible. From the experimental data, sifted, analyzed and correlated, the possibilities for therapeutic application may be suggested, and likewise the expectations, justifications and limitations of usage, in definite, objective terms. The great advantage of this procedure, as the first step in determining the value of a remedy, is that it gives a fairly definite idea of activity under conditions which can be controlled to a considerable extent, and thus permit fairly accurate inferences and deductions, without which the treatment becomes uncertain and indefinite, or guesswork.

The final test of therapeutic usefulness must be made on the patient under conditions which permit a complete and exact assessment of the usefulness and limitations of the remedy. The biologic variables which exist here are as great as, or even greater than, in other living forms, with the great disadvantage that these variables cannot be controlled or eliminated as readily in man as in animals. For instance, the very useful and direct anatomic method of analyzing physiologic functions is impossible of application here. Generally, the analysis must be indirect, and therefore clinical evaluation is not so satisfactory and conclusive. Nevertheless, it is generally possible to arrange observations of functions which will yield data of value and reliability, which may then be used to confirm the experimental data. This can be attempted in various ways according to the character of the drug and the actions to be expected, but important always is the blank control test without any medication whatever. Comparisons should always be made with well-tried or standard agents, when new agents are being tested. Quantitative data, whenever possible, are of the greatest value, as in the case of drugs acting on the circulatory, respiratory, excretory and secretory functions, and on etiologic factors such as bacteria and parasites. Publication of all results and confirmation by independent observers are always desirable, if not indispensable, for the general acceptability of claims for a therapeutic remedy. Now, all this as a general method of procedure for the investigation and evaluation of remedies is comparatively old, since it was practiced over 125 years ago with the first alkaloid given to medical science, namely, morphin. Yet, this natural and logical process is frequently neglected.

It is true that some of our most important remedies have come to us in reverse order, i. e., after extensive usage in practice, in some cases for centuries, and preceding experimental demonstration and analysis of their actions. From this, it is sometimes argued that experimental study is useless and superfluous, if not misleading, since admittedly by itself it cannot establish therapeutic usefulness and efficiency. Nothing can be farther from the truth. The old empiric method by which these remedies came into being was guesswork, a form of experimenta-

tion, if it can be called that in the strictly scientific sense, which was frequently misleading, cruel and inhuman. Consider the knowledge of some of our most important drugs then and now: Opium was recognized for centuries as a narcotic, but the cause of the action was not known until 1803, when the alkaloid morphin was isolated and experimentally tested. The action of digitalis was at various times ascribed to effects on the kidney, the body as a whole, blood pressure and the heart, until pharmacology showed that it acts mainly as a cardiac remedy. Mercury was used in the treatment of syphilis for centuries without its being known whether it really benefited the patient, and, if it did, whether it acted on the disease or on the patient. Cannabis, chloral, bromid, cinchona, ipecac, ergot, ephedra, many heavy metals, and certain hypnotics, purgatives, anesthetic potions and even cocain were used for years, or decades, before their actions and real value and limitations were determined with the aid of the experimental method. It can be truthfully said that the exact mechanism of the important actions of most of these remedies is still not understood, but at least we are no longer misled and inconsiderate. All of which recalls the wisdom of the Chinese, whose proverb says: "He that knows not, and knows that he knows not, is wise. Encourage him."

From all this, it follows that the principles for guidance in determining and assessing the value of remedies rest on thorough, fundamental, pharmacologic studies, followed by clinical tests, under controlled conditions. On these, accuracy, safety and dependability, and all progress, in therapeutics depend. This applies to all classes of remedies. But it is the group known as proprietary or patented products, whose merits are frequently undemonstrated and claims of usefulness exaggerated, which offend the accepted methods of medical science and constitute an insidious abuse of practitioners and the public.

These products are commonly exploited through the medical and dental professions. This is done by cleverly conducted advertising, sales-talk and free-sampling. Frequently, the products have long or difficult chemical names calculated to impress the uninitiated with the unusual talents of the promoter for discovery and achievement. The name may be therapeutically suggestive, indicating the disease or symptom for which the drug is claimed to be useful and generally superior to anything offered previously. Today, more than ever before, large numbers of proprietary remedies, questionable compounds and mixtures, which sometimes have a certain experimental basis, though lacking originality and clear and definite evidences of merit and usefulness, are seeking the approval of the dental and medical professions. Heaps of synthetic products are being thrown on the market and promoted by clever propaganda and pseudoscientific activity of manufacturers. The expectations of more products are promising, if anything, for it is claimed that chemistry can now be credited with 300,000 organic compounds, and more than 250,000 of these are awaiting pharmacologic and therapeutic tests! No fear of unemployment here, for there is to be work for generations upon generations. The important question is not how many drugs, but how well we understand the comparatively few that are worthy. There have been, and probably will be again, some few acceptable proprietary products of value, but, in the aggregate, this is not true, and the professions are hard put to it separating the sheep from the goats. The Council on Pharmacy and

Chemistry of the American Medical Association long ago apprehended the strictly commercial interests of proprietary manufacturers and has patiently demonstrated during more than a quarter of a century that acceptable proprietary remedies are obtainable only at the price of eternal vigilance.

The dental profession must beware of the Greeks bearing gifts. There is danger of lapsing back to a situation of thirty years or more ago when dental and medical schools were proprietary institutions, places for gaining prestige and for exploitation of commercial wares and propaganda.

As a rule, dentists have no difficulty in recognizing the value of their materials and the reactions of tooth substance as bases for mechanical treatment or prevention. Exactly the same attitude and the same scrutiny, in point of principle, are necessary in selecting agents for medicinal treatment. It is singular that so much confidence may be reposed in what is claimed for the power of a remedy, without consideration as to whether the claims are true, and application of the same criteria and principles as are applied in the conduct of ordinary affairs. The path of least resistance appears to be followed, not necessarily because of indolence or ineptitude, but more probably as the result of a lack of understanding of the remedy itself, and of the procedure to be followed which would yield a satisfactory result. Consequently, there is reliance on suggestion and authority. Unfortunately, this weakness of human nature is not limited to patients, but it is certainly less excusable in practitioners, who have opportunities for finding out and knowing better. The safest procedure is to choose those remedies which have been tried and found true in terms of sound logic and scientific principle and evidence; to disregard claims of unusual superiority, specificity or general applicability for a remedy. Appealing and obviously exaggerated or misleading claims should be enough to cause one to discard any remedy. In the exercise of caution and discretion, the dentist will not only render a duty to himself, but also perform a valuable service to the public. The qualifications and the mental equipment for this service can best be acquired by a preparation and training which should create a healthy skepticism and conservative frame of mind, than which nothing more is needed in the field of therapeutics. For these, it is necessary to be grounded in principles and equipped with solid facts before going into practice.

Dental schools, I understand, are not yet generally equipped to teach the fundamentals of pharmacology. There is not adequate provision for a first hand acquaintance with pharmacologic data and principles for guidance in the study of drugs, on which all sound thinking and progress in therapeutics rest. Lectures or textbooks on materia medica and therapeutics are inadequate, and, in themselves, are obsolete as a means of instruction. Dental students should have opportunities for the direct observation of drug action on tissues, organs and organisms and the recognition of laws which govern the reactions of functions to the changes brought about; or, in other words, to observe and study pharmacologic phenomena by experimental methods. This is a most valuable and generally useful discipline for developing habits of critical and logical thinking, and for equipping the mind with definite values and criteria, tangible future assets, useful for twenty to thirty years later in practice. Moreover, pharmacologic experimentation faithfully recapitulates all degrees of drug action under clinical

conditions, and is the basis for experimental pathology, which indicates the intensely practical nature of this discipline in the curriculum. Such instruction is not expensive nor difficult to introduce, individual laboratory exercises not being absolutely indispensable. Most of the subject for the purpose could be readily and profitably presented by demonstrations. Until this gap in dental education is bridged, practitioners can hardly be expected to exercise the critique essential in therapeutics, or even to look for, or profit by, the sources of information in this field.

In recognition of the weaknesses and the abuses which exist in the field of therapeutics as it applies to dentistry, the American Dental Association has created a committee to whom it looks for guidance in this difficult and troublesome field. This committee, known as the Council on Dental Therapeutics, has now been in existence a little over a year. Its work has scarcely begun, but it is already confronted with plenty of interesting and difficult problems. At this time, I may briefly indicate the general purpose and some principles and results which have shaped themselves from this brief experience. The object and the rules of the Council have already been published. In brief, the purpose is to improve the status of therapeutics in dentistry by advising the dental profession and public concerning the value and usefulness of proprietary remedies on the basis of acceptable scientific evidence, and to promote the teaching and research of pharmacology and therapeutics by approved, objective, scientific methods, in dental institutions. The Council can succeed in its purpose with the aid of teachers and clinicians, who will follow the aims and principles of the Council, and with the active support of each and every individual dentist insisting on the use of only those remedies which it has accepted. The Council aims to be constructive, basing its decisions on critical and acceptable scientific evidence along the lines that I have indicated in this paper. Hence, if dentists will apply the same criteria in the choice and use of therapeutic remedies, there can be no conflict of views or opinions, only unanimity and progress. The Council recognizes meritorious remedies of value and quality and gives every encouragement and consideration to new points of view and principles, provided these appear reasonable and are supported by evidence worthy of the name. Its actions may sometimes appear destructive, but these are to be properly regarded as constructive, for here, too, judgment and decision have been guided by the same scientific criteria and the same impartiality and disinterestedness as in other cases. Thus, by supporting this attempt at sane and constructive efforts by the American Dental Association, the members of the association and all dental institutions and practitioners have in their hands a unique opportunity, indeed, a privilege, for a real and substantial contribution to human welfare and to dental progress. For there is no reason to believe that the human race could be made any better by the consumption of so many proprietary remedies, patented products, mixtures and what not, most of which are valueless and useless, and many of them dangerous.

Recognizing the evils inherent in mass medication with the classes of drugs known as hypnotics and analgesics, the Council is giving considerable attention to this problem, which has peculiar ramifications in dental therapeutics. The hypnotics and analgesics carry an appeal to the dentist's sympathy, and thus are the choice drugs for commercial exploitation. Many of them are effective against the

pain and restlessness accompanying disorders of all kinds, are convenient to take and produce their effects easily and without serious acute poisoning. Even if carefully guarded, they may be employed by the laity for disorders other than those for which they have been legitimately prescribed, and thus self-medication results. This, in turn, may obscure the symptoms and prevent the diagnosis of serious disease. Drugging without diagnosis spreads from patient to friend, by gossip or hearsay, and presently whole neighborhoods and communities are consuming quantities of these products beyond belief. These are the ideal drugs for habit-formation and for narcotic enjoyment and pleasure, and all that these practices connote. Yet, it is a common claim for many of these drugs that they are nonhabit forming. In matters of this sort, the Council's position is firm; for if such a claim were allowed, it would be going against the experiences of the human race from remotest times. Then there are numerous mixtures of hypnotics and analgesics, such as barbital and acetylsalicylic acid (aspirin) or amidopyrin, for which exaggerated claims of greater activity, lower toxicity and smaller dosage are made. Here, again, well-known facts and principles regarding the sojourn of the components of the mixtures in the body and the effects of their actions on one another prevent the recognition of such mixtures as safe therapeutic remedies. Consequently, the practitioner assumes a grave responsibility in their careless, injudicious or promiscuous use, and in advising the use of or prescribing these classes of products.

The vast multiplication of drugs of the hypnotic and analgesic classes, most of which lack originality, demonstrated merit and value, but are vicious, amounts to a scandal. The commercial exploitation of these products and of numerous mixtures of them is not a creditable performance of industrial pharmaceutic chemistry. During the past year, the manufacturer of a proprietary hypnotic was able, through such methods, to flood the country with free samples and literature, which contained limited scientific data of a kind, and thus caused wholesale "researches" with his product in university clinics, in physiologic laboratories and in private practice. Ultimately, the whole number of a medical publication was devoted to papers on the drug. The value of these investigations may be judged from this uniquely conceived performance with a view to commercial prestige, domination and profits. As for therapeutic merit, disinterested scientists had no difficulty in estimating the true value and limitations of this drug, which differed only quantitatively from well-known members of a large group of hypnotics, and the most flagrant claim for its alleged usefulness and superiority was not allowed. The participants in such affairs have only themselves to blame. The long-suffering public, always slow to discover the evils which are insidiously foisted on it, is at last slowly awakening and defending itself by enactment of legislation against the promiscuous sale and use of the barbital hypnotics. At least two states and the largest city in the land now require a license for prescribing these drugs. In view of all this, let every dentist ask whether he does not owe it as a duty to himself to act in behalf of public justice, righteousness and safety.

Other classes of drugs exploited before the dental profession and coming before the Council are antiseptic lotions and pastes, usually mixtures, so-called tonics, nutrients, vitamins, endocrine products, heavy metals, salts, etc., for which claims of prevention of injury to, and decay of,

teeth are made. Many of these products are inert. Others are of undemonstrated value in dental and related conditions. In the case of mixtures and trade-marked products, the actions may be due to some well-known drug or constituent, the remaining constituents being superfluous. Sometimes, a well-known and official drug in a mixture is offered under a different name, perhaps therapeutically suggestive, or an official drug is sold under just another name and the cost far exceeds that of the same thing under its common chemical or official name. Hence, the use of such products is not only irrational and unscientific, but it is also uneconomical and constitutes an unjust abuse of the public. If anyone is unconvinced of the economic wastage caused by wholesale medication, I need only refer him to the reports of the Committee on the Costs of Medical Care, in which the example of Shelby County, Indiana, is a startling proof. In this county, which has an estimated population of 25,000, more than half a million dollars was spent in 1928 for the care and prevention of illness. Of this total, somewhat more than one-third (34.8 per cent), or the largest share, was spent on drugs and medicines, somewhat less than one-third (28.6 per cent) for the services of physicians and the remaining third for care of dentists, nurses, hospitals and other agencies. The eight drug stores in this county sold $145,000 worth of preparations and products for medical care, or about $18,000 per drug store. Of this amount, $67,000 went for patent medicines, or about $8,000 per drug store per annum. Chicago has 1,956 drug stores, and if the expenditures on medicines are similar to those in Shelby County, the totals spent for medicinal products in Chicago would be $35,208,000, and for patent medicines, $15,648,000. Apply these estimates to the United States and the results are staggering. It is thought that the American people will spend $200,000,000 on patent medicines this year. These are colossal sums for materials the value and usefulness of a large share of which can be questioned. It is known that a goodly share of such medicinals consist of proprietary products as such, and in mixtures of all kinds. The paradoxical aspect to this situation is that manufacturers of some of these proprietary remedies are seeking the approval of their products by the medical and dental professions. Instances such as these have come before the Council recently. The packages sold to the public and displayed in drug stores may be different from those offered to practitioners, and the dual distribution is not easily suspected.

The literature accompanying proprietary products sold or offered to dentists generally advises their use in other disorders outside the scope of dentistry. The claims for dental and remote disorders are run together, or attempts are made to justify the remedy for conditions assumed to affect the teeth and mouth, and vice versa, leaving little doubt of encouraging dentists in medical prescribing without diagnosis, in somewhat the same sense as pharmacists may be encouraged in counter prescribing by the use of patent medicines, package preparations of proprietaries for the public, etc. Let me quote some claims for products of this type submitted to the Council, and which neatly illustrate what manufacturers think of a wide scope of commercial possibilities in making use of the dental profession. An analgesic of inferior quality was stated to be "useful in hysteria, migraine, gastralgia, gastritis, vomiting of pregnancy, exhaustion, hypochondria, syncope and certain reflex neuroses," obviously a group of more or less common

complaints in ill-defined conditions, frequently the gossip topics of neighborhoods.

Most of these conditions are not necessarily referable or related to dental disorders and do not come within the scope of dental therapeutics. The product was not accepted.

Here is a hypnotic presented to the Council the advertising literature for which stated that the drug was "indicated in general nervous disorders, in dysmenorrhea and neurotic symptoms occurring at the menopause, palpitation of the heart, alcoholic excesses and nervous indigestion," another group of common conditions presenting opportunities for promiscuous prescribing and self-medication. It must be said with credit to the manufacturer of this product that when the Council pointed out the undesirability of claims of general therapeutic usefulness, of nonhabit formation and of general indications in the advertising circulars and package labels for the dental profession, the removal of these claims was agreed to and the product was accepted. Here, I may paraphrase the opinion of the Council from one of its accepted reports:

> The legitimate use of a hypnotic by a thoughtful and responsible practitioner is one thing, but it is only a step to advising or suggesting the trial of such a drug in some dentally unrelated complaint of his patient by a solicitous, ignorant or unscrupulous practitioner. Moreover, the patient himself may discover the ameliorating effect of the drug on some other complaint and presently indulge in self-medication, with all its attendant evils. Consequently, claims of usage in conditions other than those with specific or general bearings on dentistry have no place in the advertising or sale of products to dentists. If such claims were permitted, they would tend to discredit the constructive efforts of the Council to rationalize the use of dental therapeutic agents.

In a product extensively exploited before the dental profession as a nutrient remedy, the tablets for oral administration are claimed to contain parathyroid gland, among other things, and it is claimed that the presence of the parathyroid substance supplies an essential factor for proper calcium assimilation and fixation. But this claim is unphysiologic and misleading, for the real usefulness of parathyroid has not been established, and, in ordinary and healthy individuals, it is inert when taken by mouth. I merely cite this instance to illustrate that the dentist must be continually on his guard against claims for remedies whose components may possess activity under other conditions, but which do not apply in his practice.

Another fruitful group of products for commercial exploitation and spreading of misinformation, capitalization of credulity and reaping of enormous profits are those preposterous therapeutic nonentities known as dentifrices, which, however, cannot be considered here. The vast majority of these products fall into the "patent medicine" class, and, in several instances, are exploited in daily newspapers, weeklies and the lay press in general, by manufacturers who make great pretense at scientific research and market proprietaries to, and desire their approval by, the professions. It is a curious contradiction in motives, although it can be understood, for it has been estimated (*New Republic,* Jan. 15, 1930) that the people of the country can be bled to the tune of $60,000,000 annually for dentifrices. However, it passes all understanding when the same products are advertised in journals devoted to dentistry. Hence, what can be expected of lay publishers who presumably are not so well qualified to judge the claims as a dental editor? Provisionally, the Council has

adopted a liberal attitude on composition of dentifrices and is accepting products claims for which are held within reasonable limits, but, eventually, the acceptability of these products will have to be justified by scientific evidence. Information on the merits and value of many dentifrices can be found in the reports of the Council already published, and, if not, can readily be obtained from the secretary of the Council.

In performing its office as an advisory body on scientific questions concerning the general scope, status and acceptability of dental materia medica and therapeutics, the Council is publishing reports on proprietary products, and articles of an editorial nature on accepted drugs and on problems and subjects of interest and importance, prepared by its members, or by invited, qualified persons. The Council has in preparation a small volume which will contain acceptable and useful dental remedies with short descriptions of their properties and actions and doses and will contain both nonofficial and official drugs, regardless of source, origin or affiliation. This, it is to be hoped, may act as a useful means of limiting the materia medica to reasonable proportions and be of value to dental examiners, students and teachers of pharmacology and therapeutics. The inspiration toward this was given by the book called "Useful Drugs," published by the American Medical Association, and which has been found of great value and usefulness in the building up of a selected materia medica in medicine; a book that has been accepted by the national and state medical boards as the basis for examinations to practice, and by many hospitals as representing the most important drugs. Such a book cannot take the place of the teaching of pharmacology and therapeutics, but it can be employed as a basis and guide to the selection of agents which have been agreed on as being worthy and of prime importance, for further and intensive study. Such a book should be particularly useful to practitioners as a quick reference guide to old and new remedies and for refreshing the memory with essential facts and details which are easily forgotten. By frequent revisions, such a book can be kept abreast of the times, which cannot be said for textbooks and for such official books as the U. S. Pharmacopeia and National Formulary. The latter books are valuable as reference works for standards of identity, strength and purity, as they contain descriptions of the chemical and physical properties of drugs and their preparations and are recognized as standards by the Federal and state governments. They do not contain proprietary or secret remedies. They cannot be used to teach pharmacology and therapeutics, or as bases for therapeutic acceptability and usefulness. On the contrary, the majority of products in these two official books are therapeutically unessential, or unnecessary, but they have been included for various reasons which cannot be discussed here. Those official preparations which are therapeutically useful are to be preferred to the same products marketed under trademarked names, in secret preparations, or which are identical, or nearly so, with untried proprietaries, because the official drugs are definite as to quality and generally less expensive. A new pharmacopeia is now in process of preparation, but as there is a general feeling of doubt as to outcome of the revision, and a loss of loyalty and attachment of the medical profession as the result of events in the convention, which ended in a fiasco because of political and commercial methods, the dental profession will feel the need of such a

book as is being prepared by the Council for its use and guidance.

Thus, by a proper application of scientific principles, which determine the value and use of therapeutic agents, dentists can make a real contribution to progress in the field of general therapeutics and firmly establish the special field of dental therapeutics. Achievements here are bound to emphasize materially the scientific basis for all procedure in dental science, which is the only true basis on which security, safety and progress rest. In this way, dentists may expect to achieve for human welfare and for protection against deception and fraud, and against promiscuous and unnecessary medication. All this is slow work, requiring courage, foresight, patience and diligence, for habits of decades are not corrected in a day. The Council bespeaks the active support of every dentist in the valuable, constructive and humanitarian work which the American Dental Association has undertaken.

SUMMARY

Therapeutics advances by the same methods which are recognized for the progress of the physical, chemical and biologic sciences, for it embodies and recapitulates the laws and principles which are the basis of results and achievements in these sciences.

Therapeutics has nothing to reap but chaos, wastefulness, deception, injustice, cruelty and inhumanity from political and commercial methods, and from untested authority, opinion or experience. But it has everything to expect from the scientific method of experiment, sound logic and rational procedure. These tenets are applicable not only to therapeutics in general, but also to the special field of dental therapeutics.

The general result of the application of scientific principles in dental therapeutics means accuracy, dependability, safety and success, for the patient and practitioner. It spells the defeat of ignorance, prostitution, deception and fraud, still too commonly evident in this branch of dental science.

Thus, it will elevate the character, self-respect, knowledge and ability of the practitioner and sustain him in his rôle of humanitarian and scientist and promote the best interests of dentistry in the mitigation, prevention and cure of disease.

SOME ECONOMIC ASPECTS OF DENTAL PROPRIETARY REMEDIES AND NOSTRUMS*

By HAROLD S. SMITH, D.D.S., Chicago, Ill.

IT is desirable that as dentists we, from time to time, take inventory of the things which have occurred and are occurring within our profession. We can all look back over varying spans of time and, in our individual minds, group the important happenings in dentistry into various epochs. In the past three years, two most significant movements in organized dentistry have been developed. Reference is made to the creation of the

*Read at the first general meeting of the Chicago Dental Society Midwinter Clinic, Feb. 2, 1931.

American Dental Association Committee for the Study of Dental Practice, and to the formation of the American Dental Association's Bureau of Chemistry and the Council on Dental Therapeutics. At first glance, there may appear to be little relationship between a committee studying economic and legislative activities of dentistry and the bodies organized to study scientifically the drugs used by dentists and the proprietary dental articles sold to the public. On careful thought, these activities are seen to be closely interlocking.

One of the factors with which dental economics concerns itself is that services may be made available to everyone. When we say services, we, of course, imply not alone the technical service rendered by the practitioner in his office, but also all the collateral agencies which have to do with the protection and maintenance of the dental health of the people. Most of the operating technics in dentistry may be reasonably considered to have reached a definite status as to art or science. We can hardly claim the same for the materia medica used in our profession. This is, at the present time, largely empiric and unscientific. The Council on Dental Therapeutics has as its object the protection of the public and the dental profession against fraud or imposition, undesirable secrecy and objectionable advertising in connection with the marketing of proprietary dental articles.

A proper attitude of mind is needed by all concerned in any efforts toward dental therapeutic reform. The honest manufacturer has a definite part in the movement. He can lay all his evidence before the Council and be assured of receiving just treatment. If he makes good the claims for his product, it will be accepted. If he cannot make good his claims, his product is not entitled to the confidence of the profession. There will be no conflict with the Council except as regards those who obstruct scientific progress. Obviously, many of the tasks of the Council are uncongenial, but so in many cases are the tasks of the Bureau of Standards at Washington.

Occasionally, the more serious tasks of the Council are lightened by something of a more or less amusing nature, as illustrated by the following communication:

> One of our clients is planning to place on the market, a toothpaste for the exclusive use of children, and in preparing and advertising this toothpaste, they would like to be guided by the best ethics of your organization.
>
> If you can suggest a good formula for such a toothpaste, it will be greatly appreciated.
>
> Thanking you in advance, we are

It is the desire of the Council to be entirely impartial in its relationships with manufacturers, and it is a pleasure to state, thus far, certain manufacturers have indicated a commendable cooperative spirit in the work of the Council. The Bureau of Chemistry and the Council are most appreciative of the friendly and understanding cooperation rendered them by the American Medical Association through its comparable agencies.

It is claimed that the public spends millions each year for nostrums. Certainly, millions are spent on nostrum and pharmaceutic advertising, some of the copy of which seems intended to make well people believe that they are sick and sick people believe that they are sicker. In the dental sense, this may be illustrated by the morbidity of certain oft seen copywriters' twaddle, such as "four out of five," "pink toothbrush," "the danger line," "three shades lighter in three days" and others. That this is not a figment of the imagination is indicated by the latest publication of the Committee on the Cost of Medical Care, which shows that, in a typical American city of

38,000 inhabitants, most of them having some physical defect or condition needing scientific treatment, adequate care is rarely received, but in a large measure patent medicines having indirect professional endorsement are relied on. An example of this has been the distribution to the public of clinical samples of a certain headache remedy and other pain relievers. This is adequately described in the report of the American Dental Association Bureau of Chemistry on Anacin, published in THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION. Certain patent medicine promoters are anxious, for obvious reasons, to utilize the plan of inviting practitioners to write for "clinical samples," through use of a coupon in certain dental journal advertisements. Through this practice, an untold amount of self-medication is sponsored by the dental profession. I trust that none of these commercially sampled nostrums are dispensed in the clinics of any of our dental schools. That self-drugging with mixtures containing acetanilid and acetphenetidin is a harmful procedure needs no argument, and the statistics have been presented elsewhere.

Opposition by the earnest-minded dentist or physician to the practice of self-medication is not based on his fear of being affected economically to any appreciable degree, but rather on the fact that the use of patent medicines and certain advertised proprietary remedies carrying directions for self-medication oftentimes delays the rendering of adequate professional care to the patient when most needed. He also appreciates the fact that the practice of self-medication is poor economics as far as the public welfare is concerned. Further illustration of this will be found later in this paper.

Each year, dentists in their practices use many drugs and preparations, some of which are proprietary, for which exorbitant prices are often paid. Many of them are secret formulas, carrying some fancy copyrighted name, and carrying, in some cases, in the literature accompanying them, therapeutic claims which may not be supported by scientific evidence. This situation would probably not exist if the therapeutic training of the dentist were adequate. If it were adequate, he would consult the United States Pharmacopeia and the National Formulary regarding the therapeutic agents required, and secure them on a basis of rational costs, rather than on the tremendously inflated prices of proprietary formulas, agents, mixtures, etc. In connection with the use of such products, the question might well be asked, "What defense would a dentist have were he forced to admit in court that he used a drug or preparation whose composition was secret, and for whose therapeutic claim little or no scientifice evidence was available?" Here arises the question of public esteem of dentistry as a profession. Surely, we all agree that the public's concept of us as a group of health workers is a most important matter. In my mind, the two factors just alluded to, the esteem of the public and the basic cost of drugs and therapeutic agents used in dental practice, contain broad economic significance. Parenthetically, it is little to be wondered at that medicine and not dentistry has been the beneficiary of many philanthropies. It is not enough to ask for philanthropy: philanthropists must be convinced.

Dentifrices have brought notoriety and fortune to many, including the black faced comedians, soothsayers, and the so-called "dental specialist." It is claimed that the sale of dentifrices in the United States totals more than $60,000,000 each year. It is not unreasonable to state that

some of the most obnoxiously advertised dentifrices have kept many of the public from competent dental care when most needed. In spite of the limitless claims for prevention and cure of pyorrhea and tooth decay, the ravages of these diseases are apparent to anyone who is observant, and exist even among that great class of the public who are users of dentifrices. An earnest group of dentists, who were impressed with the benefits of oral hygiene through the services of competently trained practitioners, may have been responsible for that moth-eaten slogan, "A clean tooth never decays." This slogan was seized on, capitalized and corrupted by commercial adventurers ready to grasp at any straw that would net a profit to them. Thus began a competition for increased sales in which no claim was too ridiculous, and the constant use of this phrase has tended to put the dentist in a false light. The sincere early workers in the field of mouth hygiene would fail to recognize the malformed creature this beautiful child of their conception has become. Theirs was the idea that healthy oral conditions might be benefited by attention to general health, and prophylaxis by competently trained practitioners, all of which would surely have improved the economic condition of the public. The dentifrice makers center their attack around the toothpaste, claiming for it alone almost miraculous powers, putting to shame much of the old patent-medicine advertising. The significant point is that, in the eyes of the public, the dentist has been made to appear as merely an incidental factor in oral health service by these advertising claims and counter claims. See your dentist twice a year, and use our toothpaste all the year! The betting odds in this seem economically in favor of the advertiser rather than the public and the profession.

The dentist has been barraged by the follies of the copywriters, and the honest questioning of the patient, "Doctor, what dentifrice shall I use?" Should his answer be, "Oh, use any one, they are all alike," or should the last sample received be the favored one? Should dentists silently allow their patients to spend $60,000,000 a year, with no word of protest concerning the spurious claims of some manufacturers? Should the public be allowed to feel that the dental profession approves false advertising statements? Is it not high time that the dental profession announce in no uncertain terms that it no longer countenances such raids on the public health and purse?

Dentistry seems to be awakening. The Council on Dental Therapeutics has, by its provisions, limited the claims of dentifrices to only the reasonable expectation that a dentifrice can do nothing more than aid in the cleaning of the teeth. Through the position of the Council in this matter, the public may be informed as to both the proper value and the limited usefulness of dentifrices, and not be forced to rely on the extravagant advertising claims and fantasies of word-mongering copywriters.

One of the great problems which have long faced the dental profession is that of the treatment of the disease commonly called pyorrhea. The etiology is complex and the treatment not as yet specific. Dentists are making an earnest effort to study, treat and control this disease. Each case presents its own particular problems, and, as we all appreciate, requires individual consideration. Each practitioner may have his favorite method of handling each type of case.

In connection with the treatment of this disease, in the sense of economic consideration, I will cite a matter which has recently come to my attention. There was

submitted to the Council a preparation for which remarkable cures were claimed in the treatment of the disease. The evidence purporting to sustain the claims made was certainly not inspiring, for seemingly it was largely a collection of uncritical testimonials from a limited number of practitioners. The product in reality is nothing more than a practically discarded drug, listed in the National Formulary. Approximately $15 worth of this preparation, if purchased under its proper name, could be secured for about 50 cents. The practitioners were asked to believe that here was something new, something remarkable. Although none of the testimonials referred to contained any reference to improvement of conditions through the application of the usual prophylactic treatment, or to changes in systemic conditions; to changes through the use of known drugs or through the use of the same drug under its proper name, dentists testifying to the efficacy of the product were willing to pay thirty times the cost of the basic drug and work in the dark. It cannot be denied that the inflated cost connected therewith may, in the end, have been reflected on the patient.

One of the most insistent problems considered from both an economic and a social aspect is the prevalence of caries. It is claimed to be one of the most widespread of human diseases, and one about which more has been written and perhaps less actually known than any other dental disease. The cause and control of caries has baffled the most sincere students of the subject; consequently, the disease has represented a vast economic drain on the public. That dentistry, through practical operative procedures, has done much to check and repair the ravages of caries cannot be denied. Nonetheless, certain promoters of proprietary remedies are more certain of the "cure" than are the conscientious investigators and practitioners. It has long been recognized that systemic conditions, particularly during the prenatal period and the early years of childhood, are reflected in the character of the adult mechanism. The exact interrelationship of the facts connected with these matters has not as yet been fully defined.

The dentist who recommends medicinal agents to his patients, in the absence of direct evidence as to their usefulness, may be innocently making himself a party to his patients' paying higher prices for readily available materials.

Evidence is accumulating that dentition is dependent on many internal factors, some of which are related to the question of nutrition. What these factors may be, no one can say with certainty at the moment. Hence, questionable products, if exploited to the public and the profession without adequate evidence of value, surely delay the clinical application of treatment based on results obtained in the laboratory, and thus deny to the public the advantages of well-founded therapeutic procedure.

But a few of the relationships of rational therapeutics to the economics of dentistry have been mentioned. They may serve to show the close association of the two.

Dentistry exists as a public-spirited profession. Any movement or scheme of exploitation that tends to divert the individual dentist from that point of view interferes with his proper function as a guardian of public health. As a professional body, dentistry is the beneficiary of certain privileges from the State. In turn, it devolves on organized dentistry to extend special benefits that the group can give in matters of daily routine of the practitioner, through their interpretation of the advances made in dental re-

search, and the rank and file in the profession should adapt their practices to this advanced knowledge in order to protect the public in matters dental, whether in connection with health education, proprietary remedies or nostrums of dental character. Only a militant program on the part of the profession can bring about these things.

When the profession is being exploited by individuals or groups subversive to the public welfare, there should be no fear or timidity in a frank and fearless discussion of the situation. The indignant voice of the profession should be made articulate through every available channel. This has long been done effectively in the medical profession through the Council on Pharmacy and Chemistry, the Bureau of Investigation and the fearless and militant policy of the *Journal of the American Medical Association.* "People who live in glass houses must not throw stones," and dentistry's house must not be made of glass. Reports of the American Dental Association's Bureau of Chemistry and the Council on Dental Therapeutics have given to organized dentistry a remarkable opportunity to assume an attitude of aggressive action in therapeutic reform.

What can the dental profession do to improve some of the aforementioned conditions and to protect the public and the profession from fraud, imposition, undesirable secrecy and objectionable advertising?

1. The officers and members of all state and local societies should keep themselves advised of the activities and findings of the American Dental Association's Bureau of Chemistry and Council on Dental Therapeutics, and support the work of both these agencies in every possible manner. In relation to such support, it is suggested that the journals of these societies refuse advertising space to nostrums, proprietary remedies and articles claiming to have dental therapeutic value which do not meet with the approval of the Bureau of Chemistry and the Council on Dental Therapeutics.

They should refuse to permit placement in the programs of their societies essayists, or clinicians, whose papers or clinics act as a medium of propaganda for nostrums, unworthy proprietaries or therapeutic agents, or otherwise give evidence of a commercial background. Through the editorial columns and otherwise, the profession's journals should give support to the work of the two mentioned agencies of the parent body which are laboring to protect the interest of the public and the profession. The dentist has a right to know the evidence upon which the editors of our dental journals accept advertising copy, and should feel free to request such information from any editor at any time.

2. The giving of testimonials, solicited and unsolicited, is a hazardous practice for members of the dental profession to indulge in. True it is, such are often obtained through crafty and guileful practices on the part of some manufacturers. Chickens come home to roost! Testimonials given in a careless moment may prove tremendously embarrassing at a later day, particularly if they apply to some product or technic not strongly supported by adequate scientific evidence. Do not give testimonials.

It may be interesting to note that the American Medical Association has maintained for years what might be termed a testimonial morgue in their files, in which are recorded the names of several thousand physician addicts of the testimonial habit, together with exhibits of the copies of such testimonials. Perhaps a similar exhibit might prove interesting and de-

sirable in the American Dental Association files.

3. The membership at large, the House of Delegates, the Officers and Board of Trustees, can insure the accomplishment of the aims and objectives of the Bureau of Chemistry and the Council on Dental Therapeutics by vigorous and militant support of both agencies and thus assure the protection of the public and the profession in all matters lying within the scope of the above mentioned agencies. With THE JOURNAL perhaps lies the greater responsibility in supporting these activities, through the maintenance of clean advertising columns and through militant editorial support. Honest and serious-minded dentists must look to the advertising pages of their journals for what they believe are honestly advertised products. They should not be exposed to disillusionment. How much dependence can dentists, who think the matter through, place on the present misleading advertising of dentifrices?

The American Medical Association has a background of twenty-five years of vigorous activity on the part of its investigation departments, such as its council on pharmacy and chemistry, and also its journal, while our own Association is at the pioneer stage of this problem through the efforts of its similar bodies. This is our critical period.

There is evidence on every hand that the public is becoming educated in medical matters, and if the dental profession expects to retain the respect of the public, it must practice scientific therapeutics. The public could not be criticized for becoming disgusted with the dental profession if it does not clean its own house. As a profession, dentistry has oftentimes had the benefit of the public's support of desirable legislation, which is of economic significance. Can we in fairness expect the public to continue to do its part in supporting restrictive legislation if the dental profession is a party, either tacitly or actively, to the exploitation of the public by proprietary manufacturers. The intelligent public appreciate the profession's interest in keeping it from inexpeditious spending of its money for unworthy therapeutic agents. The money which the public might otherwise use for the purchase of inefficient preparations could thus be used in obtaining effective dental service in the interest of preventive dentistry.

In connection with progressive undertakings related to therapeutic reform, there are some who continue to obstruct by various and specious arguments, such as "reforms come slowly," and "the dental profession cannot afford to antagonize the commercial interests," and "dentistry owes much to the proprietor because he has made the public dental-minded." These arguments are but smoke screens, and every thinking dentist knows that dentistry should be an independent and self-respecting profession. Arguments that some journals make that they cannot cancel old undesirable advertising contracts should be accepted with reservations, and certainly there is no excuse for accepting advertising contracts for various new proprietary remedies which cannot pass the rules of the Council, and thus possibly unwittingly betray the trust of the profession.

Another specious argument is that if a product has not been condemned by the Council, it must be acceptable for advertising. Why put the cart before the horse? A manufacturer desiring to advertise his product honestly should have no fear of the opinion of the Council. The attitude of the dentist should be that no new or unofficial product should be advertised or used until it has been passed

on by the Council on Dental Therapeutics. That a busy dentist does not have time, nor possess the specialized training to evaluate new drugs, is no reason for his being a party to the exploitation of what might prove to be a worthless preparation, or a well-known basic preparation claiming unusual virtue and masquerading under a coined name, to be sold at an exorbitant price. Members of the dental profession, these are *your* problems; the Bureau of Chemistry and the Council on Dental Therapeutics are but agencies to aid you in their solution.

THE PRESENT STATUS OF DENTAL JOURNALISM: THE RÔLE OF EDITORIAL AND ADVERTISING POLICIES, IN THE CAMPAIGN FOR REFORM OF PROPRIETARY DENTAL ADVERTISING

By BISSELL B. PALMER, D.D.S., F.A.C.D., New York City

A PROFESSION is weighed and judged by its educational standards, the importance of its accomplishments for the public welfare and the quality of its literature. Dental education has been passing through an important period in its evolution. Today, in both its preliminary requirements and its curriculum, its progress indicates that certainly in this field dentistry is endeavoring successfully to meet its responsibilities. We can also take encouragement from the fact that whereas in 1921 there were fourteen proprietary dental schools, today there is not a proprietary undergraduate school in the profession, although medicine still has six such institutions. The development of our technical knowledge and skill over the past decade is generally acknowledged to have been phenomenal, and recognition of the importance of our rôle in health service also merits approbation; but in our periodic literature, we fall far short of the standards that should prevail for a dignified and learned profession.

An active interest in the cause of independent professional journalism for over twenty years, the past two of which have been spent in an intensive survey of the entire field, has acquainted me with the various types of dental journals, their qualifications and deficiencies. If we except the establishment of THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION, the *Journal of Dental Research* and a few other periodicals, it might be said in entire truth that dentistry has made no fundamental improvement in its journalism during the past generation. Many flimsy excuses, but few justifiable reasons, can be offered for the present deplorable state of our journalism, but the principal cause is the unwillingness of the dental profession to commit itself to the financial responsibility associated with the conduct of a dignified, independent journalism. It is undoubtedly true that dentists pay a lower subscription price for their periodicals than do the members of any other profession. The humiliating part of the situation is that the dental

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profession, directly or indirectly, is actually paying a high price for everything it receives, and in permitting trade-house journalism to represent it, the dental profession sacrifices its self-respect, while deluding itself with the belief that it is obtaining something for nothing. The publication of our proceedings in periodicals owned and exploited by dental trade-houses is one of the principal reasons that full public recognition of dentistry as a true profession is withheld. The lure of free publication of society proceedings in these trade periodicals should not attract us. The assurance given by the periodicals that they are being published in the interest of the dental profession is unadulterated humbug, for the dental trade corporations are not in any sense philanthropic institutions, and would not publish their periodicals unless they expected that the expense involved would be more than met by the end-results.

As suggested previously in this presentation, the subscription price for our independent dental periodicals has always been too low, and many of the economic failures of these journals have been caused by their inability to meet the competition of the low subscription prices of trade-house publications. The result has been a tendency to place too large a proportion of the financial burden of publication of the periodicals on the advertisers. Now we find that, as a result of many years of indulgence in a sort of "free lunch" type of journalism, and what amounts to almost a system of racketeering in connection with the financing of our large conventions, we have lulled ourselves into a state of lassitude in this relation. We evince no concern over the question as to who pays the legitimate expenses of our professional organizations, or why. The lack of sensitiveness regarding these matters has developed into a callousness, which has deprived the profession of a sense of the moral fitness of things such as would permit us to recognize as incongruous and vicious various conditions that exist in dentistry today. Until our profession shakes off this lethargy and assumes an attitude of self-respect by developing an independent, professional type of journalism, it cannot raise itself as a profession to a higher opinion in the minds of those outside the profession who observe our deficiencies.

One of the serious weaknesses of our journalism, often mistakenly related to the economic aspect of it, is the acceptance of advertisements containing false or deceptive claims. In this connection, it is interesting that although the *Journal of the American Medical Association* has placed the tightest restrictions around its advertising pages, and at the present time is charging the highest rates in the history of that journal, manufacturers evince a strong desire to purchase space for their advertisements. The commercial journals, conducted primarily for profit, can hardly be expected to keep their advertising columns free from sales propaganda for the type of nostrums that have been denied publication in the *Journal of the American Medical Association*. The periodicals controlled by the dental profession have not had the slightest excuse for carrying such advertisements in recent years, and certainly such a practice is not pardonable at the present time; for the facilities and records of the American Dental Association's Bureau of Chemistry and its Council on Dental Therapeutics, as well as those of the American Medical Association, are available for verifying the accuracy of the claims and statements made in any questionable advertising copy.

Before proceeding with this presentation, I wish it to be understood that I realize that, unfortunately, these matters could not be brought before you in the frank manner made necessary by the very nature of the subject without the possibility of injury of the feelings of several whom I would spare such unhappiness. My only apology can be that it is not that I love my colleagues less, but that I love my profession more. I am encouraged, however, by the editorial entitled, "Stand Pat" which appears in THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION this month (February). One of its paragraphs reads as follows:

> The namby-pamby, noncommittal man may step through the world very smoothly and comfortably, but he never works any great reform and never accomplishes anything really worth while for the benefit of his fellowmen. The disturber of the peace when that peace has become pernicious may be the greatest benefactor of his race; while the neutral, negative and noncommittal man may be a menace to society.

The spirit of this editorial lends promise to the hope that any criticisms made in this paper will be accepted as constructive in intent, and impersonal in application.

In 1927, the House of Delegates and the Board of Trustees of the American Dental Association authorized the establishment of a bureau of chemistry, and followed this, in 1929, by organization of the Council on Dental Therapeutics, the latter body being the executive group directing investigations of the validity of the advertised claims of dental industrial products. This body began to function in January, 1930, and has not only presented numerous analytic reports exposing dental nostrums, but has also been responsible for elevating the character of the advertisements of many dental manufacturers. At the January, 1930, meeting of the Board of Trustees of the American Dental Association, the Council requested action on certain resolutions. These resolutions had to do with measures that would demonstrate to the manufacturers of proprietary products that the American Dental Association and its official organ of publication, THE JOURNAL, were solidly behind the Council morally, and would aid it in every way to enforce its regulations pertaining to the advertising of dental proprietary preparations. The Board of Trustees acceded to the request of the Council and adopted the resolutions, which were as follows:

> 1. That, after July 1, 1930, advertising of proprietary remedies in THE JOURNAL will not be accepted unless the product and the advertising have been accepted by the Council, except in such cases as existing contracts legally obligate the Association to continue advertising copy until the conclusion of the contract.
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> 2. That the Business Manager be advised not to accept for exhibit in the commercial exhibit proprietary remedies which are not acceptable to the Council on Dental Therapeutics on and after 1931, and that after 1931 journals carrying advertising matter relative to products not acceptable to this Council shall not be accepted as exhibitors.
>
> 3. No paper endorsing or introducing a new remedy will be accepted by THE JOURNAL until the Council shall examine the evidence submitted and publish a preliminary report.

It will be noted that one of the resolutions specifically provided that after July 1, 1930, THE JOURNAL was not to accept advertisements under new contracts, unless the advertisements and products concerned had the approval of the Council. The issue of THE JOURNAL for March, 1930, contained an editorial commenting on the first two of these resolutions, and the outlook seemed most hopeful for excellent progress. In the issue of THE JOURNAL for August, 1930, two advertisements were found that had not ap-

peared previously, and being skeptical of their type, I made inquiry and learned that neither product had been approved by the Council.

In an organization as large and active as the American Dental Association, departmental errors and misunderstandings are always a possibility, but the utmost care should be exercised to avoid such occurrences when they may lead to unfortunate interpretation.

One regrettable aspect of this situation is the fact that those who have been striving for a higher type of dental journalism are forced to retire to a weak defensive position when the owners of commerical periodicals point to the advertising pages of our own official JOURNAL as an authoritative example. They can in entire justice say: "Clean your own house before you make any suggestions to us."

THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION, representing as it does the great body of organized American dentists, is looked on by other professions and philanthropic agencies as the chief journalistic criterion by which the dental profession should be judged. THE JOURNAL therefore holds a tremendously important place in dental affairs, and its keystone position is so obvious that further constructive references might be useful at this time.

One of the prime purposes of our JOURNAL is to function as an effective mouthpiece of the American dental profession, particularly through its editorial pages, where it should give definite expression to the ambitions, ideals and efforts of organized dentistry. It should speak for the dental profession in the same clear, forceful, courageous manner as does the representative periodical of the American Medical Association, and should mold opinion regarding the important dental problems of the day.

The dental profession through its official publication should express a militant altruism in the sense of important public service, and, in the spirit expressed by the editorial "Stand Pat," should not shun controversy should it be found necessary for the public good. Only by such vision and understanding, coupled with the spirit of a crusader on the part of its editor, can the attention of the profession be focused on the many matters vitally related to its progress.

Dentistry, if it is to rise to its full stature and usefulness, must adopt an active program and depend for its accomplishment largely on the effectiveness of its representative journal. Such a program should include:

1. A definite, constructive and illuminating editorial policy in our official organ of publication in relation to the status of dentistry, dental education and the relationships of the profession. Editorial cognizance should be taken of dentistry's broad problems, and the profession should be acquainted with the facts when serious destructive efforts confront it, and be advised as to protective measures that may be invoked.

2. A frank and fearless discussion of the situation when the profession is exploited by individuals or groups subversive to the public interset. In this category should be listed, among others, those advertisers of dentifrices who, in the name of oral hygiene, exploit the public with misleading claims, and impose on the dental profession with deceptive statements indicating an affiliation with it in its public health movement.

3. A series of special articles on various current issues affecting the profession generally; for example, the disgraceful proprietary medicine situation in dentistry.

The editor could accomplish a tremendous good by inviting the preparation of a series of articles by some authority on the use of United States Pharmacopeia and National Formulary drugs in dentistry. Such a service would carry with it tremendous economic as well as scientific value. The economic aspect could be stressed because it is a fact that many of the drugs sold under secret names and formulas, at exorbitantly high prices, are United States Pharmacopeia materials.

4. An intensively active educational campaign to protect the public, as well as the profession, against spurious medicaments sold to them. In conjunction with this campaign, an editorial position should be taken against those in the profession, as well as those outside of the profession, who capitalize such exploitation.

5. A series of articles, emphasized by a strong editorial position, analyzing and attacking the present deplorable state of our dental journalism.

6. A campaign, not only against the so-called advertising type of dentist, but also against the advertising tactics of many of the profession not now so classified. A strong editorial attitude could accomplish great advances in this direction. Such a campaign should include a legislative phase that would aim to establish legal restrictions against those tradesmen who, posing as professional men, disgrace the dental profession by the use of vulgar display signs. That such a legal interference is practicable is proved by the fact that one of the largest states has already adopted such a restriction.

I believe that the enactment of the foregoing program is essential to the further progress of the dental profession, and that the editorial pages of THE JOURNAL can be made of inestimable value in advancing these and similar causes.

When the patronizing "See your dentist twice a year" campaign was launched in connection with claims of dentifrice advertisements, dentistry was given a wonderful opportunity to command a nod of respect by a sharp disavowal through its official organ of publication. When the various frank reports of the American Dental Association's Bureau of Chemistry and the Council on Dental Therapeutics were published, a splendid chance was given to dentistry to adopt a spirit of professional highmindedness. These and many other urgent calls for leadership might well have been responded to, and advantage taken of the opportunities that have been given to THE JOURNAL for outstanding service. While inspirational articles have their place in literature, obviously such matters of very general acceptance should not diminish attention to subjects of professional concern, at least not while our pages are so urgently needed for militant editorial leadership in so many important causes.

If the dental profession is to advance, the cause of independent professional journalism in dentistry must go forward, and this can be accomplished primarily through an effective editorial guidance and support in THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION. Those who have expounded the cause for the past generation have not become discouraged by the few signs of progress made, for they realize that evolution and not revolution must be depended on for advancement. Also, it is realized that even such an excellent professional periodical as the *Journal of the American Medical Association* was not just a spontaneous development, for medical journalism also has had its growing pains, and has reached its present high plane only through vision and leadership.

I believe that the following procedures, if adopted by THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION, would add to its value as the representative periodical of the dental profession.

1. Such additions to the editorial staff of THE JOURNAL as may be necessary to make feasible a more effective acceptance of the responsibilities and the opportunities for service that come to THE JOURNAL; and that would bring to the editorial columns a militant point of view that would be exercised whenever and wherever it might be found necessary for the advancement of the dental profession, or for the benefit of the public it serves.

2. The advertising section of THE JOURNAL to be conducted in strict compliance with the rules and regulations of the Council on Dental Therapeutics.

3. THE JOURNAL, at the earliest possible date, to be converted into a biweekly as preliminary to development into a weekly as soon thereafter as feasible.

Probably the greatest advancement of dental journalism will occur with the advent of a more professionally conscious generation of dentists. The higher standards now being set up as entrance requirements to dentistry will attract only that type of matriculant who will understand the meaning of the word "profession," and the curriculum of the future will undoubtedly provide means of inculcating into those students a sensitiveness that will provoke active irritability against those present-day practices of some of our organizations that to many persons tend to make dentistry seem something much less than a dignified profession.

Many of the erstwhile beneficiaries of the old proprietary school system, and the proprietary medicine system, who, despite appearances, have not changed their spots, still constitute, with their friends and satellites, an influential group in the affairs of organized dentistry. Therefore, although the dental profession is steadily advancing, it is to be presumed that *unobstructed* progress will eventuate only on the passing of this group from power in the affairs of the profession, and their supersedence by altruistic, professionally minded dentists, having a true vision of our proper relation to health service.

The Chicago Dental Society, one of the foremost dental organizations of the entire world, located as it is in the same city with the headquarters of the American Dental Association, its JOURNAL, and its Council on Dental Therapeutics, is in a strong position to exert the pressure of its influence on the important causes brought before you in this presentation. The numerous evidences of foresight, progressiveness and courage that you have shown in the past convince me that in the future your society may be expected to continue to demonstrate effective leadership in dentistry.

DISCUSSION

Paul Nicholas Leech, Chicago, Ill.: The history of this movement may appeal to a few of you. Briefly, I was approached by certain officials of the American Dental Association, in my capacity as director of the laboratory of the American Medical Association to see whether some cooperative agreement could be worked out whereby the American Dental Association might have its own arrangements to investigate and report on dental nostrums, and a mechanism whereby its official publication could clean up its advertising pages. The request came from the dental association officials—a number of them and on different occasions. We were fortunate to make an agreement to permit a qualified Ph.D. chemist first to undertake a period of training in the A. M. A. laboratory and later, with his associate (a Ph.D.), to use the facilities of the laboratory. For three years, the laboratory of the American Medical Association has been at the disposal of

the American Dental Association. Your association is to be congratulated on the leadership providing the wherewithal to obtain such splendid men. With Dr. Gordon and Dr. Shand, you are assured of men of high ideals and men who have the necessary technical ability. During this time, I have not been unmindful of the fact that I work for the American Medical Association, and that there is just one thing that organizations have in common: They are made up of human beings. When some do not fall in with a new movement or are against progress—and cannot muster valid arguments against the movement—a few of them may resort to specious arguments. Then I realize that such malcontents would try to raise the "bally-hoo" argument of outside influence. So the one thing that we have been careful about is to see that, while we have permitted the American Dental Association to have the use of our files and to have all the benefit of our advice and everything else possible, the American Medical Association did not unduly influence in any way the actions of the American Dental Association. I think that is due to you men, because it would be, I think, an insult to the intelligence of the members of your Council to presuppose for one minute that they would need guidance after the council had been formed. The matter of giving advice is dangerous. Not long ago, an almost-relative of mine called up to ask for advice concerning her sick husband. I knew him and I thought that since he was nearly a relative, I would not be going out of my way to recommend two or three physicians. This man went to one of the physicians, who diagnosed the illness as pernicious anemia. He had the usual remission after taking the liver treatment. I saw the wife sometime later and I said to her, "By the way, how is your husband getting along?" She said, "Why, he is doing fine, just fine. Now that he has taken four bottles of concentrated liver extract, he is going back to the osteopath to finish his treatments." I found today to my dismay that I had been given a little bit of an "osteopathic" appreciation myself in the way of giving sought-for advice to one of the "leaders" of American dentistry, who, it appears, is retarding the work in one way by raising the silly argument that maybe this movement in the American Dental Association was in some way guided too much by the American Medical Association. I wish to say first that, officially, the American Medical Association has had nothing to do with it—of course, it wishes the A. D. A. well in this undertaking. I wish to say, in the second place, that I have watched very carefully the work of the Council on Dental Therapeutics and that Council has not needed so much as the lifting of the little finger to know what to do. They have done a remarkable piece of work. They have accomplished more than some of the new councils of the American Medical Association in a similar period of service and I want to congratulate you on the personnel of that Council, and the earnestness and altruism with which they have gone about their work. The Council's policies and actions have been taken without referring a single question to the director of the A. M. A. chemical laboratory. This is as it should be. As regards Dr. Hanzlik's paper, a few points will bear reiteration: one is the matter of personal impression and unscientific procedure. It is so easy in the evaluation of remedies to overlook the personal element of enthusiasm. One can attribute to a drug the success which has really come about because the man himself has become a better therapeutist. A few years ago, a so-called cure came out for osteomyelitis. Four A-1 men stated that it was a fine remedy; they were getting remarkably good results from it, and they had roentgenograms and various data, all presumably to substantiate their stand. On critical analysis, it was apparent that what the remedy did was to focus their attention on osteomyelitis. They began to see more cases of osteomyelitis. They learned more about the disease and became better practitioners as far as osteomyelitis was concerned. Yet they credited the medicine with the results, while they should have credited themselves. So in obtaining evidence, it is very necessary that one use, as Dr. Hanzlik has pointed out, the blind test, that is, tests accompanied by adequate controls. If one desires to find out whether a new remedy is a good one, do not try it on this group this year and on that group another year, but take a group of 100 and divide it into two groups of fifty each. Give each group exactly the same treatment and food, except for the drugs. One group gets the new drug called "A," the other the old established drug called "B." Careful records are kept as to recovery. Not long ago, I was in a dentist's chair, and the

dentist began spraying my gums with one of these high-powered "fizzing" machines. I said, "What is in that stuff?" and the answer was, "Astring-o-sol." "Well," I said, "what is in the Astring-o-sol?" and the answer came back, "I don't know." Of course it was not funny to me that he or anyone else was willing to put down my throat something he didn't know anything about. I said, "How do you expect me to stand for that?" The reply was, "We have so many samples that we have to get rid of them some way." Dr. Smith made another good point. We live in a period of organized society; at least we think we live in a period of organized society. So far as the professions are concerned, we at least do not have our machine guns; and in order to get along, we have to stand in the good graces of society in general, and legislatures in particular. It is a very important thing in the matter of legislation to have the public back of it. If you will look over the field of public health, you will find that the legislatures have been liberal. One reason for that is that they have felt that the members of the professions are really striving to overcome ignorance in matters of health; and that, irrespective of financial remuneration, they are more interested in the advancement of public health than they are in their own remuneration. One of the ways in which this can become more and more evident is for a profession to be self-respecting, to fight the matter of quackery, not only for its self-respect but for the protection of the public as well. The medical profession has made a record in fearlessly fighting quackery. The question is asked you: Has the dental profession fearlessly fought quackery? I cannot but revert to one of Dr. Smith's remarks about these slogans of "See your dentist twice a year," "Four out of five have it," "Beware the danger line," "Beware the pink tooth brush." One of the best concerns dealing in dentifrices—if not indeed the best—has in the last six months gone wild on a certain kind of so-called scientific evidence. They have found such a thing as surface tension, and they have gotten together six scientists; five of them belong to the same category—unfortunately they are chemists. I say unfortunately because I am a chemist; I am not a dentist and I am not a physician. I am simply here as a plain outsider, trying to discuss these three papers. Well, these chemical scientists have found surface tension is a great attribute and they are trying to educate the public to the fact that surface tension is what will make the tooth paste get behind the crevices and remove what is there. I cannot but feel that if surface tension were all that it is claimed to be by this firm, there would be no need for a toothbrush at all. All you would need to do would be to put a little surface tension in and let it do the work. And certainly—if we are to believe these statements—I would not advise my son to go into dentistry, for there would be no need of dentists, except in the case of pugilists and persons who have lost their teeth because they lived to be 80 or 90 years old. It is too bad that in this day and age the intelligence of the profession has to be insulted by just that sort of bunk, and that is all you can call it. It is just rank bunk. They did not tell you or the public that soap and glycerin plus a little chalk has essentially the same surface tension as that of Colgate's tooth paste. [Since this statement was made, I understand that Colgate's have agreed to withdraw such claims and that they are now marketing this product in an acceptable way.] The men who are doing this work for you, and the men who are going to see this work go forward are your officials. It is not an easy thing to do work of this nature. It is much easier to pat your fellowmen on the back than it is to tell them the truth. So men like Dr. Gordon and Dr. Pinney deserve your support. Dr. Pinney has been particularly helpful in permitting Dr. Gordon to go forth in his work; and Dr. Gordon, fortunately, has been a courageous man. I simply want to throw that out to you, because when you see these men and have an opportunity to talk this work over with them, do so in an encouraging spirit; but at the same time, I hope you will offer them helpful criticism. It is such criticism that gives men the ideas and inspiration to go on. One other point: If a profession is to advance therapeutically, it will have to advance through the use of some proprietaries. The question is: Which are the good ones and which are not? Naturally, a firm must have data from clinical research before it can afford to give its results to the profession. This costs money. Therefore, the way to get returns on the investment is (according to present-day practice) to market the product as a proprietary. So while there are a great many proprietaries that should be looked on with disdain, you must remember that there are good

proprietaries; and those must be determined through an official group composed of leaders in the dental and nondental sciences who are willing to give you their opinion fearlessly. As regards Dr. Palmer's paper: I am not so well acquainted with dental journalism as I am with medical, so it would be presumptuous on my part to attempt to discuss some of the technical aspects of it. I might give you this one personal experience. Recently, a relative of mine had to go to a dentist. She had moved into a new locality, and by asking among friends she decided to go to a man who ranked pretty high. In the case of the lawyer, doctor or dentist, it seems that the impression of his standing varies in direct proportion to how long you must wait in the waiting room before you get a chance to see him. So she was well impressed with this dentist, and having extra time on her hands while in his waiting room, she looked at some of the literature on the table. She happened to pick up the magazine called *Oral Hygiene*. I don't know how many of you know what *Oral Hygiene* is. This young lady is a layman; she doesn't know what *Oral Hygiene* is. The next time she came to me, she said, "I have some doubts about that dentist." I said, "Why?" "Well, this journal was on the table and I saw in it advertisements of sal hepatica, listerine," and she named over a list that any intelligent layman knows is not good; "and," she added, "I wonder if that is the kind of truck he is going to use on me." Finally, and in all seriousness, if there is just one point that an outsider and a chemist holds about a profession it is that if it is going to get anywhere, it must have dignity; and that applies no less to the dental profession than to the medical; and no less to the medical profession, than to the legal. One cannot have dignity unless he has a certain amount of self-respect. I am not competent to discuss the many phases of dentistry, but certainly if dentistry is going to have self-respect and the respect of the public, that is, the dignity of a true profession—it must be competent to prescribe rational drugs and not be a party to the exploitation of the patient or of the dental profession by the none-too-scrupulous manufacturers and purveyors of the proprietary dental products.

THE WORK OF THE A.D.A. BUREAU OF CHEMISTRY AND THE COUNCIL ON DENTAL THERAPEUTICS*

By SAMUEL M. GORDON†, Ph.D., Chicago, Ill.

IN 1776, there was fired at Lexington a shot that was heard around the world, and that led to a revolution of far-reaching importance to the political welfare of millions born afterwards.

Twenty-five years ago, the formation of a body in the ranks of organized medicine started another revolution that was to afford untold benefit to the public health of the nation. I refer to the formation of the Council on Pharmacy and Chemistry of the American Medical Association. In addition, there followed in rapid succession articles in popular magazines pointing out how the public were being taken for a ride, so to speak, in the matter of harmful and dangerous medicinal products sold for the "cure" of bodily ailments, a remedy for which even advanced medical research of those days had been unable to obtain.

No preparation or claim was too rank to foist on both the medical profession and the public. Physicians and the public were subjected to a barrage of advertising that would cause present day rack-

*Read before the Section on Mouth Hygiene at the Midwinter Clinic of the Chicago Dental Society, Feb. 5, 1931.

†Secretary, Council on Dental Therapeutics.

eteers to feel like amateurs. Public indignation was aroused to such an extent that the national legislative bodies passed the Food and Drugs Act, of 1906, and subsequently certain amendments to the act. The Food and Drugs Act made lying on the label a crime, and, for the first time, there was available standards by which to judge advertising from the legal and ethical standpoint.

The story of the efforts of the national government and of the Council on Pharmacy and Chemistry in the war for the public welfare and decency in medicinal advertising is a story full of romance. These scientists, with only the thought of protecting the public interest in health matters, were subjected to personal abuse. But as in all things launched for the public welfare, right triumphed over falsehood. Sad to state, certain journals devoted to proprietary interests continue to oppose these public spirited efforts; and many abuses are still being practiced, though more surreptitiously to be sure.

These matters require the constant vigilance of the bodies mentioned if the rights of the public are not to be further invaded. As a result of the publicity activities of the American Medical Association, the Food and Drug Administration and of the newly established better business bureaus and the Federal Trade Commission, the public is being informed, but *finis* has by no means been written to the story.

On dentistry and on articles of a dental nature sold to the public, these activities have indirectly had a salutary effect, but the situation is far from desirable. The fact that organized dentistry took no concerted action in these matters left the dental profession open to some of the older deceptions. Many exploiters with more wit than scientific honesty transferred their efforts from the zealously guarded medical profession to the dental profession. Even today, many preparations are being exploited in a manner offensive to right thinking dentists.

It must not be assumed that all dentists were regarding this state of affairs with resignation. Many teaching in dental schools or in practice did all in their power to advise the profession, but this effort was after all individual, not concerted and the effect for the public good was not apparent. Even at dental meetings, a few hardy individuals dared to speak openly against the abuses to which they were being subjected. Countless *cures* for pyorrhea and caries were exploited to the profession and to the public, despite the fact that sincere studies by dental investigators could not entirely fathom the mysteries of the etiology and cure for these diseases.

At length, after the preliminary skirmishes, there came into being, about three years ago, the A. D. A. Bureau of Chemistry, which has been acclaimed by some the most significant advance in organized dentistry. The Bureau of Chemistry accepted the implications of a professional code of honor in respect to the public which it serves; for the A. D. A. Bureau of Chemistry and the newly formed Council on Dental Therapeutics hope to be intensive in the analysis and exposure of dental quackery and dental proprietary products regardless of source or affiliation of these products.

The A. D. A. Bureau of Chemistry was organized to investigate the chemical composition of secret proprietary remedies and the therapeutic claims made for them in the light of cold scientific evidence. As evidenced by the number of inquiries coming to the Bureau and the Council on Dental Therapeutics daily and edi-

torials appearing in the better grade of dental journals, this work enjoys the confidence of the dental profession.

The Bureau of Chemistry, since its very inception, has been inspired by the general thought that the protection of the public in public health matters within its sphere is the concern of organized dentistry, and the distribution of information for the protection of the public health through the dental profession is a privilege.

Such a stand needs no explanation, much less an apology. The state confers on dentists, as on other professional groups, certain rights and privileges in order that the public interest may be conserved. In turn, the dental profession is privileged, as part of its public health activity, to give out such information as may be necessary to protect their interests. The results, which have been fully treated elsewhere, speak for themselves.

It is significant that the A. D. A. Bureau of Chemistry was not formed until about twenty-five years after the Council on Pharmacy and Chemistry; hence, it has to clear up the débris of twenty-five years. How this is being done and what some of the problems facing the profession are will be here outlined.

CONDITIONS FACING THE PROFESSION

One of the direst problems facing organized dentistry today is the disreputable advertising of tooth pastes. This advertising situation has been made difficult because, on the whole, dentists were afraid to speak openly about this situation, which could not be considered to add to public respect for dentists. But every lane has a turning point; and the representatives of dentistry will soon express their views on the matter in no uncertain terms.[1]

The public and the profession are still being deluded with all sorts of advertising claims that would not stand the light of competent scientific examination. No claim was or is too preposterous to be put before the public. As time goes on, the dentist will have a basis for a straightforward answer to the ubiquitous question, "Doctor, what dentifrice shall I use?" His answer will be guided largely by the validity of the claims. Furthermore, these frank discussions by organized dentistry will yield the answer as to which tooth paste will clean best and be least harmful, without at the same time making the dentist a party to the passing on of false advertising.

But dentistry is not, as some advertising writers may have believed, centered solely around the dentifrice. The sphere of dentistry is larger and finer. Dental conditions are more and more coming to be recognized as inseparable from the rest of the human machine; and that the conditions governing scientific medicine govern the practice of scientific dentistry. Both have their roots in the broad fundamentals of biologic science. Proprietary remedy purveyors were quicker to exploit this fact than dentists were to recognize it; for they were ready to claim benefits to any condition, from local to systemic, if only they might net a profit; while dentists awaited evidence.

This state of affairs has had another angle: When the door to the advertising of many products exposed or declared not acceptable to organized medicine was closed, these products assumed, so to speak, a false air of respectability by advertising extensively in dental journals,

1. Forhan's for the Gums Not Acceptable for A. D. R., Coun. Dent. Therap., J. A. D. A., 18:548 (March) 1931.

many of which, to be sure, were published under frankly commercial auspices. Need more be done than to glance through the advertising pages of certain dental journals?

Worse yet, preparations the claims for which have been declared false and fraudulent by the national government are clothed with the same air of false respectability by many advertising editors, who boast of their service to the profession. Were it merely an out and out commercial proposition, the matter might end there. But the evil does not end there: dental readers are deluded into thinking that the advertised product has "merit"; otherwise, so he reasons, the editor would not have permitted it to be advertised. The matter goes farther, in that many of these preparations are included in textbook literature, this leading to an innocent debauchery.

Does this not retard progress in the rational application of pharmacologic, pharmaceutic and therapeutic progress to dentistry? Consider, for example, the use of so-called pain relievers as preoperative and postoperative pain measures. An examination of the composition of many of these would show that they were essentially irrational mixtures of acetphenetidin, acetylsalicylic acid, amidopyrin, sodium or ammonium bicarbonate and sometimes a laxative such as phenolphthalein. Most of these products are sold under short catchy names. I say sold to the public—yes, but through the innocent instrumentality of the dentist. The latter is invited to send the journal coupon for all the "clinical" samples that he can use. The idea is plainly palpable that this is a handy and cheap means of advertising potentially harmful mixtures to the public. The dentist hands out unthinkingly a package of two tablets on which is imprinted in bold type the name and the conditions in which to use it, conditions beyond the immediate need for which the drug was given.

The dentist thinks the matter ends there, but it does not. The patient gets not only the pills, but also information regarding its use in all sorts of ills, real and imaginary. When he has an ache or pain, off he rushes to the drug store to ask for the medicine with the short catchy name. This starts a self-drugging that may sometimes have serious consequences, because of the ever-present sense of false security which this sort of self-medication may entail. How much better it would be for the dentist to prescribe drugs listed in the pharmacopeia, whose usefulness and limits have been proved by years of usage, instead of proprietary remedies of which he knows little or nothing. Not only would the dentist increase his own knowledge of the small number of drugs needed for rational practice in this branch of therapeutics, but he would also not be laying himself open to a poor defense in the event of a suit for malpractice.[2]

The work of the Bureau in other directions has been pointed out in a series of reports. These reports do not represent isolated products but are typical of many. Take, for example, those so-called tooth bleaches, solutions of hydrochloric acid, about whose harmfulness to the teeth there is no question. The report on Tartaroff might, with few exceptions, serve for a host of others: ExCel Tooth Stain Remover, Taxi, Stain Remover, Bleachodent, Ekay, ExTartar and Snowy White. Such information places in the hands of the dentist knowledge which the public would greatly value.

But the work of the Bureau of Chemistry is, after all, just a scratch on the surface, but like a vaccine, if properly

2. Use of Pain Relievers by Dentists, Coun. Dent. Therap., this issue.

administered, it will go a long way toward building up a healthy antitoxin against proprietary exploitation in the dental body. It has served to bring home, as has not been done before, how the profession is being bribed by the 30 pieces of silver in the form of clinical samples; how they are being belittled by claims, whose proof was clear as night, made on their behalf.

THE CONSTRUCTIVE SIDE OF THE WORK

Dentists rightfully demanded: "With what shall we replace the preparations that you point out as spurious?" To fill this need, the Council on Dental Therapeutics was created by the Board of Trustees at the Washington Meeting. As many know the Council only by name, I should like to devote the remainder of my remarks to the work of the Council, and what its efforts promise for dentistry.

Unfortunately, up to now, the individual dental practitioner has not had available on drugs of promised therapeutic value the necessary unbiased information that would encourage scientific therapy. It is not overstating the case to say that most of his "postgraduate" education in this respect has come from the so-called literature put out by proprietary manufacturers, some of which were the subject of reports by the Bureau. But the organization of the Council on Dental Therapeutics has added force to the purely constructive side of the work.

Expressed briefly, the Council is a continuously functioning body to advise the dental profession and the public on dental proprietary or nonofficial remedies and materials as regards composition and therapeutic usefulness. Its endeavors will be directed toward the goal of protecting the dental profession and the public against fraud, undesirable secrecy and objectionable advertising. In pursuance of this object, the Council shall examine articles on the market as to their compliance with certain rules, which will be discussed shortly.

The membership of the Council is composed of men versed in the basic sciences and dentists, all of whom are recognized in their special fields. The roster can inspire the confidence of the profession and the public:

MEMBERS OF THE COUNCIL

Samuel M. Gordon, Ph.D., secretary of the Council, chief, A. D. A. Bureau of Chemistry.

Paul J. Hanzlik, M.D., vice chairman of the Council, professor of pharmacology, Stanford University Medical School.

Thomas J. Hill, D.D.S., professor of clinical oral pathology and therapeutics, Western Reserve University Dental School.

Percy R. Howe, Sc.D., D.D.S., director, Forsyth Dental Infirmary for Children, Boston.

Charles N. Johnson, D.D.S., LL.D., Editor, The JOURNAL OF THE AMERICAN DENTAL ASSOCIATION, ex officio.

Milan A. Logan, Ph.D., instructor in biologic chemistry, Harvard Medical School.

Arno B. Luckhardt, M.D., Ph.D., professor of physiology, University of Chicago.

John A. Marshall, D.D.S., Ph.D., professor of dental pathology and biochemistry, University of California Dental College.

Victor C. Myers, Ph.D., Sc.D., professor of biochemistry, Western Reserve University, Schools of Medicine and Dentistry.

John F. Morton, Ph.D., director, Bureau of Laboratories, Dept. of Health, Detroit, Mich.

Harry B. Pinney, D.D.S., Secretary, American Dental Association, Chicago, Ill.

U. Garfield Rickert, A.M., D.D.S., professor of materia medica and therapeutics and hygiene, University of Michigan Dental School.

Harold S. Smith, D.D.S., chairman of the Council, Chicago, Ill.

The members of the Council were chosen for their scientific ability and skill in their respective branches, and each, except the secretary, serves without remuneration. Their remuneration is that derived from their motto "We serve not for ourselves but for dentistry." And they do serve. May I spend a moment or two to illustrate how much is being exacted from the already overburdened time of these men. As the members of the Council are widely scattered, meetings, except at rare intervals, are not possible, communication between the members being through a bulletin prepared by the secretary and sent out biweekly. In this bulletin are arranged systematically reports, motions, comments, discussions, presentations, communications, etc. The last bulletin, for example, consisted of fifty closely mimeographed sheets. To read the bulletin is alone a task, but discussion on reports is a regular matter.

I have not mentioned that products are assigned to members of the Council for appraisal and report, that each member prepares a number of reports, all of which entails careful study of the evidence, in the literature, and sometimes clinical. Then, there is the correspondence, and each member may get three or four long letters a week. I am overlooking the fact that the Council is engaged in compiling a list of accepted remedies and the work it entails.

How seriously the work is being taken may be gaged from several incidents. One of our members was giving a series of talks away from home. Yet his vote sheet came on time. He had taken the bulletin along and read and discussed it between the lectures, on the train, etc. Another was going to Europe for the summer. Yet the bulletin followed him, like Mary's little lamb.

Thus, the profession has at its disposal a group of men who possess special training and knowledge for this work. Their energies are devoted to the not particularly pleasing task of winnowing from the chaff the occasional grains of honesty.

In the main, the work of the Council will be, in the light of available evidence, to pass on claims made for nonofficial preparations submitted to it. Those which are in conformity with the Council's rules will be accepted for an official list. Those which are not in conformity will be rejected. The Council may consider a product, even if such examination has not been requested by a manufacturer, provided such action is deemed to be in the public interest. Most important is that these investigations are published from time to time. The Council works not for itself, but for the profession and the public.

RULES GOVERNING THE ACCEPTANCE OF ARTICLES FOR A. D. R.

When called on to treat diseases of the oral cavity, the intelligent dentist, like the intelligent physician, attempts to make a diagnosis of the condition, to learn its cause and remove it if possible. On this principle, the Council attacks its problems. This is done in accord with a set of rules which govern the Council. In order that you may be familiar with these rules it will be worth while briefly to outline them.

Composition. — There are ten rules. Rules 1 and 2, and, in a measure, 5, 7

and 9, deal with the composition of articles. Rule 1 requires that the quantitative composition be furnished to the Council for publication. Rule 2 requires that the manufacturer furnish methods whereby the composition of products that are definite chemicals or potent constituents of mixtures may be determined. The Council does not require that the process of manufacture be declared, unless it becomes necessary to judge the composition thereby. Rules 5, 7 and 9 refer, respectively, to the source, poisonous ingredients and patents of a preparation.

No one will for a moment deny that it is not only the right but also the duty of the dentist to know the composition of what he uses or prescribes for his patient. This is generally admitted, but not always practiced. It is still common to see chemical formulas or statements of composition published which neither a dentist nor even a chemist could understand.[3] It was not unusual to find that the promoter published "a formula" for his preparation, rather than "the formula."[4] Today, a more prudent, if not more honest, course is pursued. A "formula," correct as far as it goes, is given, but it fails to divulge the actual composition of a product. To revert again to the "pain relievers," previously mentioned: Many of those which contain acetphenetidin and other ingredients give only the amount of acetphenetidin. This is not done out of generosity to the profession, I am sure, but because the Federal Law requires a statement of the presence and amount of such potentially harmful drugs. When it is considered that many dentists are not any too conversant with the chemistry, pharmacy and even pharmacology of drugs, it is not surprising that some were carried away with the bizarre claims of Sherman L. Davis and his products,[5] the exploitation of readily available materials under noninforming terms.

It is certainly not too much to require, as does Rule 2, that a manufacturer shall be able to demonstrate that his preparation has the composition claimed for it. Nor is it sufficient for him to know that the ingredients claimed as constituents were used in the manufacture. The fallacy of this method of reasoning was shown by the manufacturer who brought to the attention of the Council a preparation in which he brought together an oxidizing and a reducing agent in the same preparation, which represented a pharmaceutic incompatibility and yielded different substances from the starting material. Also, the addition of small amounts of substances to a well-known official product yielded an irrational and unnecessary modification of a well-known drug. Incidentally, to satisfy my curiosity, I found that if the same preparation were purchased according to its official name, it would cost about 50 cents, whereas the product bought under the therapeutically suggestive name costs $15. Acceptance of this rule by manufacturers will permit physicians to have a more accurate knowledge of the composition of Atomidine, Sherman L. Davis preparations,[4] Lavita[6] and Forhan's Pyorrhea Astringent.[7]

Dentists should not be deluded by the fact that a patent has been issued for a

3. Perdentin, Not Acceptable for A.N.D.R., Coun. Dent. Therap., J. A. D. A., 17:529 (March) 1930.

4. Formula for Glyco Thymoline, J.A.M.A., 52:147 (Jan. 9) 1909.

5. Sherman L. Davis Treatment, Caperoid, Etc., Coun. Dent. Therap., J. A. D. A., 17: 1744 (Sept.) 1930.

6. Lavita, Bur. Chem., J. A. D. A., 17:175 (Jan.) 1930.

7. Forhan's Pyorrhea Astringent, Bur. Chem., J. A. D. A., 16:1940 (Oct.) 1929.

medicinal preparation. The issuance of a patent for a medicinal product does not prove that such a product represents a discovery or entitles its owner to a monopoly of seventeen years; yet it is only fair to dentists and to others that notice of such patent claims be given. Too, patents have been issued for certain preparations exposed by the Bureau of Chemistry that represented advances in neither chemistry nor therapeutics.[8]

Advertising.—Rules 3 and 4 provide against recognition of articles that are advertised to the public directly or indirectly. Certain preparations with which self-medication by the laity appears to be wholly improbable or those which the Council believes safe are exempted.

The Council has taken a definite stand on the question of the public advertising of dentifrices and the like. It has already been intimated that the advertising of the dentifrice reeks with quackery. Claims beyond those supported by reasonable evidence were used. The Council holds, in view of the accumulated contrary evidence, that dentifrices can be expected to do nothing more than aid in the mechanical cleansing of the teeth. All therapeutic, bacteriologic and chemical claims are not warranted. It is not to be expected that a salutary situation will come overnight. Time is a factor. But the seed of truthfulness that has been planted will grow; for advertisers now have a reasonable standard by which to gage their advertising—if they but will.

Naturally, Rule 4 would not be welcomed by manufacturers who distribute freely "clinical samples" for lay use, and by those selling certain mouth washes; for if it is required that claims be held within reasonable limits, much of their stock in trade will be taken from them. The Shirley Amendments to the Food and Drugs Act of 1906 have done away with much of this, but the rule is nevertheless necessary, as there are many preparations advertised as being sold on the "recommendation" of the dentist, thus making him a party to untenable claims. Rule 4 is intended to protect the dentist against making himself a "pedlar" of unwarranted claims.

Therapeutic Claims.—Rule 6 makes ineligible for A. D. R. any articles for which the manufacturers make unwarranted, exaggerated or misleading statements as to therapeutic value. Recognition of the long-continued custom of therapeutic exaggeration in dentistry makes it more difficult to determine the degree of optimism and conservatism which might be required of a manufacturer. In view of the common acceptance of individual impressions of dependable evidence, it is almost embarrassing to declare as incompetent the statement of some well-meaning and kind-hearted doctor. Yet this is the position the Council had to take in connection with the testimonials submitted in the Sherman L. Davis case. As the pitfalls of haphazard clinical trials become better known and the dentists' mistrust of glowing accounts of marvelous cures becomes more outspoken, the manufacturers' claims will become more moderate, and certain prophets of misguided dental science will not blow their horns so hard, at least when it comes to selling proprietary products.

As this paper is being written, there are before me letters on two products which were sent to the Council. One is on a "cure for pyorrhea" and Vincent's infection. In this case, I am willing, for the sake of discussion, to admit the good intention of the promoter. Frankly, the blame belongs on the dentist in the case.

8. Semafor, Bur. Chem., J. A. D. A., 15: 2357 (Dec.) 1928.

Harsh, but here are the facts. Evidence for the therapeutic usefulness of this preparation consisted merely of letters from a half dozen dentists stating that they had obtained beneficial results from the use of it. No controls, no comparative trials with drugs well known to be efficacious in the treatment of the disease, were submitted. The dentists frankly were not in a position, from the meager number of data available, to know whether any supposed benefit was due to his own skill or a change of systemic conditions or the result of the medication. The dentist evidently did not trouble to inquire whether this preparation was essentially different from an official product, which it obviously was not. By his unthinking endorsement, based on a too meager examination, he was unconsciously furthering the sale of a product for $15 which could be purchased, at the outside, for 50 cents, if bought under the National Formulary name.

Another example is the case of a mineral water. The manager of an agency distributing mineral water wrote inquiring as to how to obtain tests showing its usefulness as a mouth wash. He cited information from his own dentist who used it as a mouth wash in two cases of mouth infection which, it was stated, cleared up rapidly; and from the head of a dental clinic who agreed to make a casual examination of it. In reply, he was advised that casual tests were worse than none at all, and the head of the school clinic was reminded that casual tests would make matters worse, that if he was going to make any tests, they should be thorough from all angles. Unfortunately, much of the evidence for certain products sold to dentists is altogether too casual and this is in large measure responsible for the conditions that required the formation of the Bureau and the Council. If a professionally trained man lets his enthusiasm run away prematurely, what may we expect of those not so trained? It must be said to the credit of the head of the clinic that he accepted the view presented.

Nomenclature.—The naming of medicinal products is a subject that can occupy many pages of discussion because in it are found many of the evils of proprietarism. About ten years ago, one of the unsung heroes of modern medicine, Dr. W. A. Puckner, secretary of the Council on Pharmacy and Chemistry of the American Medical Association, put the case thus:

> Were it possible to exact and enforce a law which would oblige manufacturers to sell their medicinal products under properly descriptive names and which would make it illegal for a physician to prescribe it unless he understood the meaning of such properly descriptive titles, then the Council might safely disband. In that case physicians would discontinue the use of most proprietary preparations in favor of established drugs, and successful newcomers might each year be counted on the fingers on one hand. Such a rational nomenclature is not to be thought of in our generation.
>
> Rule 8 requires that the name of an article shall not be misleading, that it shall not be therapeutically suggestive and that established drugs shall not be disguised by fanciful names. It recognizes the right of discoveries, and interposes no objection to arbitrary names for such products as long as such names are not misleading or do not suggest the therapeutic use of the products. As the rule provides against the recognition of coined names for established new proprietary drugs, so it requires that mixtures of drugs shall bear names descriptive of their composition. It would be a long step forward if physicians would recognize more fully the objections to the many proprietaries which have as their only originality, a non-descriptive name for an old drug or a mixture of well-known drugs.

The situation, as Professor Puckner stated it ten years ago, is applicable with

equal force today, showing the need for an advisory service such as the Council offers. As the rules of the dental Council are adopted from those of the medical council, his prognostication was exact. What originality is there to the many preparations reported on by the Bureau of Chemistry and the Council: Tartaroff, Mu Sol Dent, Anacin, Atomidine, the Sherman L. Davis preparations, Perdentin, etc.? many of these objectionable not only from the standpoint of lack of statement of composition, unwarranted claims to the public and profession and misleading names, but also because they are irrational and thus their use befuddles the dentist, and cheats the public.

Irrational Articles.—Rule 10 does not permit the recognition of a product which, because of its composition, is useless or inimical to the best interests of the public and the profession. This rule would exclude from admission articles of no therapeutic value or whose use is irrational. For articles, or for mixtures containing two or more ingredients, the Council will require that the manufacturer establish the rationality of such combination. This rule will not admit many of the unnecessary preparations which are said to be ethical specialties. Though testimonials can be had for them, they contain no evidence that the mixture was superior to its potent ingredient.

WHAT ARE YOU GOING TO DO ABOUT IT?

Here, for the first time in the history of dentistry, is a basis on which to judge an ethical remedy. If these remedies conform to the rules, they may be considered ethical; if they do not, they are not ethical and are not worthy of your attention. This is your standard. When a detail man comes with something new or old, ask him whether it has been accepted by the Council, and if not, why not. It is your part to support the Council reports by suitable action.

The Council works solely and wholly for the interests of the profession and of the public. There have no doubt been changes for the better since the work started. But the Council and Bureau are purely advisory bodies; there is no law to compel their recognition. Hence, without the support of the profession its work will be of no permanent value. The support must be more than passive; it must be actual support, and the support can be measured only as you act according to the reports. If the profession does not support the Council, the work for protection might just as well stop now. Make the detail man prove to you that he has something new and have the editors of the dental journals prove to you the grounds on which they accept advertising —tell them you're from Missouri. If the preparation is not accepted by the Council, ask them why. In closing, I cite a letter from a dentist in Indiana who shows that he not only believes in the good the Council is doing but also put his belief into practice most forcibly.

Dear————:

You have asked for the opinion of my profession concerning a booklet which you propose mailing to all school parents in ———. That is why I am writing you this.

You, no doubt, are well aware that the average dentist has neither the time, facilities, money, nor training necessary to inquire into the merits of all products that are sold to or through his profession. It was to satisfy this need that he created within his own organization (A. D. A.) a Council on Dental Therapeutics.

This same Council has not seen fit to accept the remedies of Dr. Sherman L. Davis. That is why we cannot approve the mailing of the pamphlets.

Please understand our motives. There is nothing personal in this refusal. We are seek-

ing a remedy that will do the things that Sherman L. Davis claims for his. Nor do we state that it is without merit. We simply say that we cannot recommend to the public any preparation that does not satisfy the Council on Dental Therapeutics.

WHAT IS THE FUTURE STATUS OF NONANATOMIC POSTERIOR TOOTH FORMS IN FULL DENTURE PROSTHESIS?*

By VICTOR H. SEARS, D.D.S., New York City

IN these days of rapidly changing conditions, it is hazardous for one to attempt prophecy. No one can accurately fortell the changes in science, politics, religion, education, business or dentistry. The most that can be done in any particular is to indicate trends and tendencies. The purpose of the present discussion is just that—to indicate and in part explain the tendency toward the use of nonanatomic posterior tooth forms in full denture prosthesis. It is still too early to say the final word on the subject, but it is high time that the matter receive the discussion and the study that its importance warrants. If we can but lay aside all preconceived notions as well as all emotions, and view the problem in a spirit of scientific inquiry, there is little doubt that we shall quickly arrive at substantial agreement. The "nearly perfect" tooth form has not yet been developed, but we of the dental profession can presently produce it, if we combine our ideas and efforts.

Those who have taken no special interest in the matter may be surprised to learn that thousands of patients are now being fitted with the several types of newly devised posterior teeth each month. Neither this fact nor the increasing popularity of these teeth proves the merit of the idea, but it does assure an opportunity for evaluation. Another interesting fact is that many of those men who were originally indifferent now rank among the enthusiastic proponents of the principle. Since the newer forms became available, there are dentists who have come to use them to the entire exclusion of the intercusping teeth.

The present discussion is addressed to the open-minded practitioners who are not entirely convinced of the superiority of the newer tooth forms in full denture prosthesis and to those who have no special acquaintance with the subject.

HISTORY

It will be recalled that the occlusal surfaces of teeth used a quarter of a century ago were far from being anatomic. They carried no high cusps and allowed the mandible to slide the opposing teeth upon each other with little interference. Crude as these early forms now appear, it must be chronicled that the patients of those days did not fare so badly in the matter of long periods of fairly comfortable service per set of dentures.

Then there came a change. By 1915, the outstanding men of the dental pro-

*Read before the Section on Full Dentures at the Midwinter Clinic of the Chicago Dental Society, Feb. 3, 1931.

fession had become converted to the more anatomic-looking higher-cusped interlocking posterior teeth. It was no mere coincident that the widespread interest in dental impressions followed immediately on the introduction of the intercusping tooth forms. The use of higher cusped teeth necessitated better fitting denture bases. The significance of this fact was not appreciated at the time, and instead of returning to cusp forms that did not cause the dislodging of dentures and traumatizing of supporting ridges, we were content to make the bases grip a little tighter. Both the cuspal interference and the excessive tightness have been the cause of unwarranted tissue destruction, and the loss of supporting ridges is a matter of greater seriousness than is generally supposed.

It is a paradox that some of our progressive practitioners, in their desire to build better dentures, have unwittingly damaged supporting ridges by employing cusps of greater esthetic charm and popular appeal; while their more conservative brother dentists saved alveolar tissues by the use of ordinary false teeth. While it is true that thousands of ridges have retained their supporting value under the irrational intercusping forms, so have other thousands failed to withstand successfully the resultant unfavorable forces. Some individuals have reached mature years in spite of large and frequent doses of alcohol; while others are unable to tolerate such treatment. We should be careful of our logic in arguing from such facts.

In the last decade, there has been a gradual recognition of the inadequacies of the intercusping teeth on full prosthetic dentures and a groping toward forms which would minimize the destruction of supporting ridges. Posterior tooth forms differing radically from the accustomed ones were displayed at a meeting of the National Society of Denture Prosthetists in 1922. In 1924, there was published a textbook[1] describing and illustrating them. More recently, several nonanatomic designs better suited to the purpose than the intercusping forms have been offered to the profession.

When this subject was presented[2] at the A. D. A. meeting three years ago, there were few who had had any experience with other than tooth forms carrying cusps. While some men immediately grasped the underlying principle and foresaw its ultimate triumph, there were critics who regarded the newer concept as a fad. Since then, the progressive members of the profession have given serious consideration to the matter, and some of them have contributed toward refinements of design.

Without any detailed description of the newer forms evolved up to the present, it is desired to place the more pertinent facts before you as impartially as possible, first, showing the rationale of forms differing from those to which we have been accustomed, and secondly, indicating an approach to the ideal in such forms. He is rash who, at this stage, dogmatically declares any specific form to be the best attainable. At the same time, an attempt will be made to fix on some of the desirable features in occlusal surfaces. It is a matter of outstanding importance which should engage the best talents in the profession.

ANATOMIC AND OTHER NATURAL LAWS

In our quest for the ideal, it should be borne in mind that a biologic pattern is a success only when adapted to conditions.

1. Campbell, D. D.: Full Denture Prosthetics, St. Louis: C. V. Mosby Co., 1924.
2. Sears, V. H.: Channel Type Posterior Tooth Forms, J. A. D. A., 15:1111 (June) 1928.

The mere fact that a trout is eminently fitted for wriggling through the water by means of its flexible body and tail does not prove that an artificial body like a ship should be propelled by the sinuous movements of its keel and ironsides. Similarly, the human tooth, so admirably formed to function under normal conditions, loses its fitness when no longer supported in the normal way. It should be further pointed out that if chewing forces prove traumatic to the investing tissues of natural teeth, as they sometimes do, these forces will be much more harmful when the teeth do not have their normal anchorage. In making inventions, man's first impulse seems to be to copy Nature in structure and action; but merely copying Nature without due consideration of the essential differences between normal and abnormal conditions would betray us into many inadequacies and incongruities. It is one thing to copy natural forms blindly, but it is quite a different thing to understand how Nature evolves these forms to harmonize with certain conditions. In order to be appropriate, forms must at all times be adapted to purpose. We may easily miss the goal unless we appreciate the fact that Nature is easier to copy than to comprehend.

If we were to remain edentulous throughout the entire span of life, that is to say, if Nature had made us with so-called alveolar ridges but without teeth, and if man, without any pattern to guide him, had set about to devise something upon these ridges with which to chew food, it is doubtful that he would have given any serious consideration to the interlocking forms of teeth which we call anatomic. These forms, suitable when supported in sockets, have prejudiced us in our attempt to meet totally different conditions.[3] It is illogical to follow Nature when the conditions which Nature postulates do not exist.

Nature supports about two-thirds of each tooth in a solid bony foundation in such a manner as to make it difficult to remove even one single-rooted tooth; whereas, full prosthetic denture teeth may be easily removed fourteen at a time. This indicates, in part, the nature of the problem as it pertains to the retention of teeth on edentulous ridges. A recognition of this fundamental difference will remove many of the objections and make it less difficult to change from what has been to what is to be. Another fact worthy of consideration is that all natural laws are not necessarily anatomic ones. The laws of leverage are just as much in accord with Nature and just as important as those of bone formation. Without an appreciation of such facts, we might erroneously assume that a form which is unanatomic is out of harmony with natural laws.

MENTAL HAZARDS

Of course, it is not easy for any human being to divest himself of his prejudices or to change his accustomed ways. Like barnacles on a ship's bottom, countless prejudices impede our smooth progress through the waters of life. If, at the birth of each day, we could run our minds into drydock and scrape off the developing prejudices, leaving our minds clean and bright, we could sail through life more smoothly and arrive with greater speed, assuming, of course, that our minds, which could be made clean, could also be made bright.

Whether we concede it or not, we all resent innovations to a greater or less

3. Schwartz, M. M.: Some Important Considerations in Tooth Arrangement, J. A. D. A. 16:606 (April) 1929.

degree, in spite of the general recognition that the innovations of today become the accepted notions of tomorrow. Even some of our recent graduates are as cautious about innovations as seasoned college professors. This prejudice against change seems to be a shackle which hangs tenaciously on human beings even down to the present day, as witnessed in some of our "blue laws" intended to constrain us in the paths of those who lived generations ago.

When we ponder on the mild alarm with which our good forefathers greeted the steamship, the railroad, the telephone and the automobile, it was to have been expected that some members of our profession, also human beings, should view with apprehension the growing acceptance of nonanatomic teeth. Although the process is often painful, we do adapt ourselves physically and mentally to improvements. The problems of progress are both technical and psychologic. In the case of the newer tooth forms, the psychologic barriers are more difficult to surmount than the technical ones.

ANATOMIC FORMS UNSUITED

Confining our discussion to the technical aspects, let us first discuss wherein the so-called anatomic posterior teeth are unsuited for application in edentulous mouths and then indicate, as best we may, forms which would approach the ideal in meeting the conditions found in such mouths.

Because of the semicircular mound formation of the edentulous ridge, the resultant forces upon this ridge are dangerous in the following order: (1) vertical forces (least harmful); (2) buccolingual forces (more harmful); (3) mesiodistal forces (most harmful). On all three counts, the natural posterior tooth forms are poorly suited to the unnatural conditions peculiar to edentulous ridges. Specifically, the objections are as follows: 1. Anatomic forms are too broad buccolingually necessitating that too great a vertical force be directed upon the ridges. Their breadth also encroaches on the tongue space. 2. The cusp inclines of anatomic teeth as viewed from the mesial aspect are unfavorably placed with reference to the supporting tissues under denture bases. This means that, in chewing sideways, the cusps cause a lateral shift of the denture bases on the tissues. 3. The cusp inclines of anatomic teeth, as viewed from the buccal aspect, are entirely too great, causing resultant mesial and distal forces[4] to be exerted upon the denture bases. Anatomically formed posterior teeth carry cusps which fit into, and to a greater or lesser extent interlock with, depressions in the antagonizing teeth, and tend to shift the denture bases anteriorly and posteriorly. This last objection is the most serious one against natural cusp forms in full denture prosthesis. A combination of mesial forces on one side of a denture and simultaneous distal forces on the opposite side results in torsion, which causes the greatest instability of bases and trauma to tissues.

Having once seen wherein the occlusal forms of natural teeth are quite irrational when supported by prosthetic bases, it becomes necessary for us to evolve something better. Let us start with a clean slate to figure out a formula for meeting the conditions.

MISCONCEPTIONS

Before attempting to formulate specifications, it is necessary to have an understanding of the conditions under which teeth actually function. Most of

4. Jordan, L. G.: Means of Minimizing Shifting of Full Denture Cases, J. A. D. A., 15:2220 (Dec.) 1928.

us know from experience and observation the general conditions found in edentulous mouths, but it seems necessary, at this point, to discuss three facts that some individuals have chosen to discredit: (1) the extent of lateral jaw movement in chewing; (2) the need for horizontal freedom of movement, and (3) the necessity for balance.

It is claimed by some that the human jaw merely opens and closes without any side movement, and that, therefore, tooth forms need not provide for side movements. There are several facts which refute this notion, but one very conclusive one will suffice: It is that shiny facets develop over wide paths on the occlusal surfaces of the teeth. The extent of this side-to-center movement is shown by the worn facets on the upper first bicuspids in hundreds of cases examined. These facets measure more than 4 mm. laterally from centric occlusion. This fact alone disposes of the "open and shut" theory.

The second important point about which there has been some misconception is the necessity for unrestricted horizontal movement of the jaw when the teeth are in occlusion. In the field of orthodontia, as well as, perhaps, periodontia and partial prosthesis, it may be necessary to consider the interlocking of opposing cusps for the purpose of preventing a "drift" of the mandible. In the case of full prosthetic restorations, any locking whatever imperils the supporting structures. The mandible must be allowed unrestricted freedom in its horizontal movements. Any attempt to hold the mandible in position by means of cusps will result in forces which have just been pointed out as being the most destructive to supporting ridges. Here again, the objection is based upon theory rather than upon clinical experience.

The other fact which is closely related is that dentures are more stable, more serviceable and less injurious to the supporting tissues when properly balanced. We have the bald statement of certain individuals that balance is unnecessary and there are eager ears attuned to any statement which will absolve us from our professional responsibility.

There are some interesting theories which tend to prove the desirability of balanced occlusion,[5] but there is one outstanding clinical fact which overshadows all of the theories pro and con: unbalanced and unsatisfactory dentures—hundreds of them—and dentures made by many different technics—have been made immediately, markedly and lastingly more stable, more comfortable and more efficient by properly balancing them.

These three facts, the existence of extensive lateral jaw movements, the need for horizontal freedom of jaw movements and the desirability of balanced occlusion must not be omitted from our calculations in continuing our efforts to evolve an ideal tooth form.

One other misconception of lesser importance should be mentioned in passing. It has been maintained by some that food is retained on the occlusal surfaces (so-called food tables) by means of gravity. If this were true, it would present a problem in the hospitals where patients eat with their occlusal planes at various angles with the horizon. The truth of the matter is that the food bolus is placed and held in position almost entirely by the tongue, lips and cheeks. The need for "food tables" at right angles to the pull of gravity is based upon theory but not upon clinical experience.

With these fallacies out of our way and ignoring any preconceptions in the

5. Sears, V. H.: Balanced Occlusions, J. A. D. A., 12:1448 (Dec.) 1925.

matter, we are now in a position to make a survey of the technical factors which enter into our problem.

TECHNICAL FACTORS INVOLVED

For purposes of discussion, we may conveniently divide the technical factors in the problem into three groups: (1) anatomic and physiologic considerations; (2) functions of posterior teeth, and (3) physical laws to be observed.

1. *Anatomic and Physiologic Considerations.* — (*a*) Edentulous ridges are more or less semicircular mounds of osseous tissue thinly overlaid with mucous membrane.

(*b*) Like all living tissue, both the osseous structure and the mucous membrane are traumatized by pressure exerted beyond the point of toleration.[6]

(*c*) This point of toleration is nearly always so low that forces from all directions should be minimized.

(*d*) Forces which cause denture bases to slide upon the supporting tissues are especially destructive.

2. *Functions.* — (*a*) The phonetic function of posterior teeth requires no special comment here.

(*b*) In the matter of esthetics, there are two important facts to keep in mind: first, that the appearance of teeth should be judged entirely in the patient's mouth, not in the hand, and secondly, that our patients are not dental anatomists. With these two facts in mind, there should be no doubt that nonanatomic occlusal surfaces in their normally unobtrusive positions can be made very satisfactory from the standpoint of appearance.

(*c*) The mechanical function of teeth is to cut and mash food. In this particular, the nonanatomic forms can be made highly efficient.

6. French, F. A.: Cusp Trauma, J. A. D. A., 11:792 (Sept.) 1924.

3. *Physical Laws to Be Observed.*— (*a*) To insure maximum stability of a movable object resting upon a supporting surface, the force must cause a resultant pressure directed at right angles to the surface. In proportion as the direction of an applied force is reduced from a 90 degree angle with reference to the supporting surface, the stability is reduced.

As applied to occlusal surfaces, this means that the chewing forces should be directed at right angles to the supporting ridges. Properly designed tooth forms tend to resolve the chewing forces in this ideal direction.

In passing, it should be mentioned that correct tooth form makes more obvious the necessity for correct degree of jaw separation. From a mechanical standpoint, that degree of jaw separation is correct which parallels the opposing ridges upon which the chewing is done.

(*b*) The greatest forces should be directed upon those structures best able to resist them safely.

As applied to the edentulous ridge, this means that the chewing forces should be directed as much as possible upon the two bicuspid and first molar regions and not upon the anterior or posterior extremes.

(*c*) The force required to pass through a given mass varies directly in proportion to the area of the surface involved.

As applied to teeth, this means that with broad occlusal surfaces, greater vertical force is exerted upon the supporting tissues than with narrow surfaces. To reduce these forces, the occlusal surfaces should be made narrow buccolingually.

(*d*) Forces directed upon diverging walls cause resultant forces in the direction of the convergence.[7]

As applied to prosthetic dentures this means that the expanding action of the tongue against diverging lingual walls causes the dentures to be pressed upon their basal seats. These simple mechanical principles should be applied to tooth design.

TWO TYPES OF TEETH NEEDED

With this survey of the conditions that we must meet, together with the laws that we should observe, and with a recognition of our varying prosthetic proficiencies, it should not be surprising to discover that the ideal tooth form will be ideal only for the dentist who possesses sufficient skill and inclination to employ it, and that a compromise form will be more suited to the technic of the average practitioner.

Just as a rifle is more precise than a blunderbuss, so may we expect to find the ideal tooth form more accurate in function than the compromise form, but only so when used with care and skill. The rifle is an instrument of precision, while the blunderbuss is a contraption which scatters the shot and may score a hit if only approximately aimed. As we have dentistry of the high-power rifle variety, so have we also blunderbuss dentistry. Until we all become crack marksmen, there will be a place in dentistry for blunderbuss teeth. But before discussing the needs of the average dentist, let us give our thoughtful consideration to teeth for the dental sharpshooter.

IDEAL SPECIFICATIONS

In order for teeth to fulfil the requirements of comfort, efficiency and non-destructiveness under edentulous conditions, the following definite specifications are laid down:

1. There should be no projections which can catch in the depressions of the opposing occlusal surfaces. This means that the opposing teeth will glide smoothly upon each other in all of the functional excursions.

2. The area involved in any chewing effort should be reduced to that extent which is necessary to safeguard the supporting tissues against injury. The teeth must be efficient and still not cause excessive pressure.

This means, among other things, that the buccolingual dimension of either the maxillary or the mandibular teeth will be narrow. Incidentally, this also reduces the lateral lever action.

It is right here that the absolute ideal is impossible and a compromise must be reached.

It has been said that the mechanical function of teeth is to cut and mash food. As a knife-blade is ideal for cutting and a flat surface is ideal for mashing, if we are forced to accept one form it must be narrow enough to cut but wide enough to mash. This means that it is impossible to obtain the maximum in both cutting and mashing with the same form. A practical and satisfactory compromise in this one particular is, fortunately, attainable. It seems natural to suppose that the occlusal areas may, with safety, be wider in some cases than in others. It would, therefore, be advantageous to so shape posterior teeth that their buccolingual dimension could be diminished at any time without interfering with balance. The use of narrowed occlusal surfaces, resulting in diminished chewing pressure upon the ridges, has a further advantage in that the teeth of the working side more easily pass through the food

7. Sears, V. H.: Full Denture Procedure, New York: The Macmillan Company, 1929.

and come into occlusal contact. This causes the teeth of the balancing side to meet and assures balanced articulation throughout a greater part of the chewing stroke. In other words, whatever advantages there are to be derived from balanced occlusion, they are increased by the use of an ideal tooth form.

3. In the ideal tooth form, the occlusal facets against which the chewing is done should be susceptible of being placed parallel with the underlying ridges in order to direct the chewing force favorably. This means that, as viewed from the buccal side, the occlusal plane formed by the occlusal surfaces will present a line which practically parallels the crest line[8] of the alveolar ridge and not the scalloped effect of a row of so-called anatomic teeth.

4. The working facets should be so placed that they will cause the chewing forces to be exerted in such directions that they tend to seat instead of to unseat the denture bases. This means that, as viewed from the mesial aspect, the working cusps should be susceptible of being placed at right angles to a straight line between the opposing ridge crests. Such an arrangement assures the maximum stability of both dentures under chewing stress.

5. There should be at least one plane to maintain contact on the balancing side. These right and left planes may be on independent lingual cusps to be adjusted to the condylar paths[9] in right and left jaw movements; or balancing lingual cusps may be built excessively high, to be later altered by grinding in order to meet the individual conditions. In connection with points 4 and 5, an important fact is here disclosed, a fact which seems to have been entirely overlooked by designers of teeth up to the present time: The inclination of the maxillary buccal cusp is determined by the direction of the closing force upon the supporting ridges, whereas the inclination of the maxillary lingual cusps is determined by the condyle path of the corresponding side. In other words, the angles for the balancing cusps are controlled by one set of facets, while the angles for the balancing cusps are determined from an entirely different standpoint. It will be seen, therefore, that the buccal cusps and the lingual ones are independent factors and must be so treated in a consideration of the ideal tooth form.

6. The teeth should be so formed that they permit maximum tongue space.

7. They should be so formed that they assist in retaining the denture bases in position.[10]

8. The occlusal surfaces should carry sharp-edged depressions so placed as to assist in cutting food. These depressions should so designed as not to become clogged with food and thus render the cutting edges ineffective. They must be self-cleansing.

9. They should not appear queer nor arouse suspicion of artificiality when casually observed in the patient's mouth.

10. They should be susceptible of easy and rapid arrangement on the articulator and of alteration at the "try-in" and in the completed stages.

The future may reveal the advisability of incorporating other features, but these are of sufficient finality to assure an approach to the ideal.

8. Schwartz, M. M.: Some New Conceptions of Tooth Form and Tooth Arrangement, J. A. D. A., 17:422 (March) 1930.

9. Sears, V. H.: Requirements of Articulators in Dentistry, Dent. Items Int. 48:685 (Sept.) 1926.

10. Sears, V. H.: Factors Insuring Full Denture Stability, Bull. Florida State Dent. Soc., April, 1929.

COMPROMISE SPECIFICATIONS

Most of the specifications for compromise forms are identical with those just given. Of the ten, only point 5 (pertaining to balance) may be omitted. Unless the mandible is accurately centered and unless the dentures are to be balanced, lingual balancing cusps are unnecessary or even disadvantageous.

BARRIERS TO PROGRESS

Those with an historical and philosophic sense will not look for any general sudden revolution and reformation in occlusal surfaces in spite of the damage which can be laid at the door of the most generally employed present forms.[11] Even if the proofs could somehow be presented to the entire profession, there would still be certain clearly discernable barriers to progress.

1. There is little enthusiasm on the part of the manufacturers who offer nonanatomic teeth and subtle disparagement on the part of those who have none to offer. The adroit means by which the unsuspecting dentist is discouraged in his inclination to test new products would make an interesting though unflattering chapter.

2. There is the well-known reluctance on the part of the nonprogressive retailer to incur the bother and expense involved in supplying a demand before it becomes insistent.

3. So many questionable products have been offered, supported by high sounding phrases and skilful advertising, that when something of real merit is presented, it can hardly hope for an immediate enthusiastic reception. We have somehow grown to accept without question the intercusping forms, and when we accept a thing without question, we cling to it ever more tightly. This human trait, which we so easily perceive in others, is, just now, the greatest obstacle in the path of the newer tooth forms.

4. There is the hostility of many firmly entrenched and self-satisfied industrial laboratory men who like nothing better than to grind out a continuous stream of cases according to prewar standards. Worthy of our praise are the few who lead in the march of progress instead of waiting to be pushed.

5. There is the patient who may be skeptical if the dentist fails in his presentation.

Are we, then, to allow those five obstacles to impede our progress? They are impeding but cannot stop us. They are obstacles which are to be surmounted rather than ignored. As a matter of fact, they are slowly but surely being overcome. In the light of ample clinical evidence at the hands of well-qualified dentists, especially in the last three years, the profession is gradually becoming aware of this new trend toward appropriateness of form according to function and environment. While there are unquestionably certain errors of design in all of the teeth at present available, errors which experience and more mature judgment have disclosed, there is not a single valid objection to the principle of nonanatomic occlusal surfaces in full denture prosthesis. All but the most incorrigible will before long admit that there is less justification for employing anatomic cusps on edentulous ridges than there is for fixing fins and scales on boats or feathers on airplane wings. Dentists who have been using the newer tooth forms feel that a return to the old forms would seem like driving to the office with a horse and buggy.

11. Sears, V. H.: Some Fundamental Factors in Tooth Articulation, J. Dent. Res., 8:339 (June) 1928.

It would be manifestly unfair to condemn the dental profession for having continued to use posterior teeth carrying cusps. The newer and more appropriate forms have been available for but a short time, and the general practitioner cannot hope to test every device and every product as soon as it is offered. In a busy practice, one hesitates to devote time to too much experimenting. On the other hand, the period of experimentation is now passed as far as concerns the general principle of nonanatomic occlusal surfaces. It remains only to further perfect the designs, and as there are now generally available several of the newer forms which are better than the intercusping ones, it is incumbent on every progressive practitioner of full denture prosthesis to become acquainted with and to apply[12] the improved forms as they are made available. There comes a time in the development of a new concept when conservation ceases to be a virtue and becomes a hindrance. With nonanatomic occlusal surfaces, that time is near at hand. At present, there are some able men still using the inappropriate intercusping forms, and we cannot, in fairness, condemn them on that account: but the time is almost passed when we can absolve them for their caution.

12. Sears, V. H.: Laboratory Management of Nonanatomical Posterior Teeth, Lab. Technician, September, 1930.

CONCLUSIONS

In the light of experience, we are now warranted in arriving at three major conclusions regarding posterior teeth:

1. The so-called anatomic occlusal surfaces and any other intercusping surfaces which cause shifting of the dentures bases are as doomed as the dodo for an ultimate place in the museum in the collection of things which have served their time but have become unfit to survive.

2. There will be the more advanced type of teeth meeting the specifications just mentioned, teeth which, when used with skill and care, will appear pleasing, which will reduce destructive forces to a minimum and will assure a high degree of comfort and efficiency.

3. Probably, there will always be compromise teeth appropriate for the average dentist, teeth which will be better than the intercusping ones, but which can be used at a saving of pains and brains.

In short, there will be precision teeth for the dentist whose aim is sure and compromise teeth for the one whose aim is poor.

200 West Fifty-Ninth Street.

A REPORT OF THE SUCCESSFUL CONTROL OF DENTAL CARIES IN THREE PUBLIC INSTITUTIONS*

By R. W. BUNTING, D.D.Sc.; PHILIP JAY, M.S., D.D.S., and DOROTHY G. HARD, D.D.S., Ann Arbor, Mich.

THE question of the relationship of diet and nutrition to the activity of dental caries is of major interest in the dental world at the present time. Studies of this question are being pursued vigorously by several independent groups of investigators in this country and abroad. These studies are based on the pioneer work of May Mellanby, Zilva and Wells, Percy R. Howe, and McCollum and Grieves, who noted that, in animals which were fed on inadequate diets, certain changes occurred in the structure of the teeth and, in some instances, carious lesions appeared. It was not found that the experimental production of dental caries was associated with any one particular dietary deficiency but that it occurred under varying conditions of vitamin deficiency and disproportions of the inorganic salts. Animals which were fed on adequate, well-balanced rations were notably free from the disease.

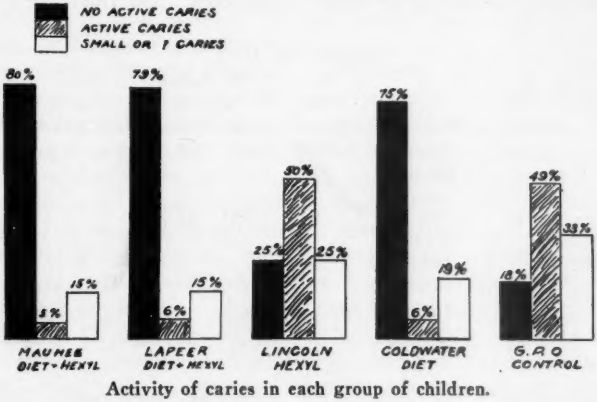
At the present time, researches on dental caries are being conducted almost exclusively on human subjects. Practical application is being made of the principles observed in animal experimentation by the regulation of the diets of children and caries-susceptible adults for the control of the disease. Such human experimentation is now being carried on by several groups of investigators, notable among which are May Mellanby, in England; Sherman L. Davis, in Indianapolis; Boyd and Drain, in Iowa City; M. T. Hanke, in Chicago; H. F. Hawkins, in Los Angeles, and our own group in Michigan. Although there is not complete unanimity of thought among these various workers as to the manner in which the specific dietary program which they have adopted operates to control dental caries, there is a practical agreement as to the premise that a child raised on an adequate and well balanced diet is less likely to suffer from the disease. Each group has reported that children fed on such diets show a marked arrest of dental caries.

During the past three years, the Michigan group have been observing large groups of children in public institutions in which the dietary program was fairly definitely known. They observed that dental caries is much less prevalent in those institutions in which the children are afforded a good diet than in those in which the food is inadequate. An experimental study of the effect of diet on dental caries was made in two groups of children in orphanages who were maintained on a prescribed diet and the dental conditions were observed over a period of two years.

*From the laboratories of the School of Dentistry of the University of Michigan, associated with the Children's Fund of Michigan.

*Read before the Section on Histology, Physiology, Pathology, Bacteriology and Chemistry (Research) at the Seventy-Second Annual Session of the American Dental Association, Denver, Colo., July 23, 1930.

The children were fed a well-balanced, well-fortified ration in which only minimum amounts of sugar and white flour were included. Each child received 1 quart of milk and some green vegetables and fruit each day. In the first group of 106 children, 35 per cent of those who gave a positive reaction to test for *B. acidophilus* became negative in this respect during the experiment, and, in 30 per cent, the growth of the organism was variable and low in activity. Among these 106 children, there were eighty-four in whom there was no evidence of active caries.



Activity of caries in each group of children.

In the second group of 228 children, 37 per cent of the positive cases became negative to *B. acidophilus* and 27 per cent were variable. In this group, there were 151 individuals in which caries appeared to be inactive.

The results of this investigation indicate that the dietary program produced a very definite inhibitory effect on the growth of *B. acidophilus* and an arrest of caries in a large proportion of the children under observation. These beneficial effects did not appear in all the cases so treated. In certain individuals of the group, the aciduric organisms thrived in the oral cavity and caries actively disintegrated the teeth. The results of this preliminary dietary experiment in the control of dental caries were, therefore, eminently satisfactory, but not so completely so as were later, more carefully controlled experiments.

During the past year, a rather comprehensive experiment in caries control was conducted in three large groups of children in public schools and orphanages. In this experiment, certain dietary and therapeutic measures were carried out over a period of one year, and the activity of dental caries was determined by very carefully recorded examinations. In two orphanages, one the Lucas County Children's Home at Maumee, Ohio, and the other the Children's Home and Training School at Lapeer, Mich., groups of children were put on a well-fortified diet in which sugar was eliminated except as it was used in cooking to make foods palatable. The elimination of sugar was made on the assumption that the average child consumes more carbohydrate in this form than is required and that such overconsumption of sugar perverts the appetite for other necessary

food factors, thus unbalancing the diet. The diet was a varied ration fortified by the inclusion of 1 quart of milk and some green vegetables and fruit for each child daily. No cod-liver oil or viosterol was given. These children had no sugar on cereals or in beverages, very little sweetened preserves and pastry, and little or no candy. In addition to the dietary control, hexylresorcinol (S. T. 37) was used daily as a mouth wash, diluted with three parts water. The object of this experiment was to determine whether by both dietary and therapeutic measures, it is possible to produce an appreciable decrease in the rate of caries. At the beginning of the experiment, the condition of the teeth was carefully recorded, and actual drawings of the approximate size and location of all cavities and fillings were made. Each record was made by two dentists, one checking against the other. At the expiration of the year, the children were again examined in a similar manner and the dental conditions compared with the records of one year previously. The results obtained from this experiment are set forth in the accompanying table.

EXPERIMENTAL DATA

Group	No.	Method	Time Years	No Active Caries		Active Caries		Small or ? Caries	
				No.	Per Cent	No.	Per Cent	No.	Per Cent
Maumee	156	Diet; hexyl-resorcinol	1	125	80	8	5	23	15
Lapeer	118	Diet; hexyl-resorcinol	1	93	79	7	6	18	15
Lincoln	104	Hexyl-resorcinol	¾	26	25	52	50	26	25
Coldwater	159	Diet	1	119	75	7	6	33	19
G. P. O.	74	Control	1	13	18	36	49	25	33

Among the 156 children in Maumee who were thus observed, there were 125, or 80 per cent, in whom there was a marked reduction of *B. acidophilus* in the mouth, and in them not a single vestige of active caries appeared during the year. There were only eight children, or 5 per cent, in whom caries was active, and in them the disease was limited to but one to three small cavities per child on the occlusal or buccal surfaces of the teeth, or to slight extensions of previous caries. In the remaining 15 per cent of the children, there were only minute dental defects which, in the opinion of the observers, were questionable caries. Among the 125 children who had no caries, there were sixty-six who, at the beginning of the experiment, had from one to ten open cavities and these cavities remained open throughout the year. At the final examination, it was found that they had not increased in size, nor were there any new lesions in the teeth. There were twenty children who had filled cavities with no extensions of caries, or new caries.

In Lapeer, among 118 children, there were ninety-three who had no new cavities and seven who showed evidence of active dental disease consisting of from one to three small cavities, none of which were extensive. The remaining eighteen children had defects which were recorded as questionable caries only. Among the ninety-three children that had no new

caries, there were fifty-seven who, at the first examination, had open cavities which were not filled during the year and which did not increase in size. Twelve additional cases had previous carious areas which were filled, but no new cavities occurred during the year.

To throw some light on the action of hexylresorcinol alone, a group of children in a public school, known as the Lincoln Consolidated School, were given hexylresorcinol as a mouth wash twice daily during the period of a nine months' school term, five days per week. This was done in the school room as a regular part of the hygiene exercises. No attempt was made to alter the regular home diet of these children. At the end of nine months, it was found that among 104 children who were included in this experiment, there were but twenty-six who had no caries, and among these were quite a number of children who might be said to be naturally immune to the disease. In fifty-two children, or 50 per cent, there were marked evidences of active caries, some of which were quite extensive. The clinical picture of this group was very similar to that of the G. P. O. orphanage control group and was vastly different from that which was observed in the two other institutions in which both diet and hexylresorcinol were used.

The data obtained from this experiment show very clearly that, in two groups of children, active dental caries was almost completely arrested by the dietary and therapeutic measures employed and that, during the year of observation, this very prevalent dental disease was made almost negligible in its occurrence. It appears that of the two methods employed, diet was by far the most active inhibitive force, but it will require other carefully controlled experiments to determine just what parts diet and therapeutic remedies severally play in the prevention of dental caries.

During the past year, a group of children in the Michigan State Public School at Coldwater, Mich., have been under observation. At the first inspection, it was observed that these children were remarkably free from dental disease and that their diet was unusually good. Although this diet was not ideal, the excellence of the general and dental health of the children warranted its continuance without material changes for one year, during which time the activity of dental caries might be recorded. At the end of the year, 159 children were reexamined; and among them, there were 119, or 75 per cent, who had no evidence of active dental caries. In them, there were no new cavities in the teeth, nor were there any extensions of open cavities which had remained unfilled throughout the year. Caries appeared to be active in only seven children and consisted of but from one to three small cavities or extensions of previous lesions. In the remaining thirty-three children, dental caries was very slight or questionable.

In studies of this character, it is exceedingly difficult, if not impossible, to obtain control groups which are fully satisfactory. During the past year one group of seventy-four children was observed in the G. P. O. orphanage, where the diet was apparently not carefully balanced and considerable candy was given the children. No alteration was made in the diet nor was any preventive treatment given. At the completion of the year, it was found that thirteen of this group had had no new dental caries, but that thirty-six, or 49 per cent, had pronounced dental lesions. There were also twenty-five who had small, or questionable, caries.

The foregoing records of preliminary studies in the control of dental caries

strongly suggests that the feeding of adequate and well-balanced diets which are suitable and available to any public institution or private home will arrest the progress of the disease. (Samples of suggested diets used in this experiment are herewith appended.) In the Maumee, Lapeer and Coldwater groups, in which fairly adequate diets were provided, active caries was almost negligible and old lesions were quite uniformly arrested. In the Lincoln and G. P. O. orphanage groups in which the diets were not carefully planned, dental disease was very active and rapid in its course. Although these studies were crude and far from exact in detail, the records show that dental caries was controlled in three large groups of children over a period of one year. These results are so gratifying that further carefully planned dietary studies of a similar nature will be undertaken in the near future.

DIETARIES

I

BREAKFAST

Stewed raisins (no sugar)
Cream of wheat Toast—buttered
Milk

DINNER

Barley soup
Beef stew with vegetables
Boiled potatoes Shredded cabbage
Green pepper salad Buttered rusks
Milk Orange

SUPPER

Vegetable soup
Baked potatoes Cottage cheese
Buttered beets Buttered toast
Milk Raw apple

II

BREAKFAST

Stewed apricots Wheatena
Toast—buttered
Milk

DINNER

Vegetable soup
Roast beef
Boiled potatoes with jackets Green beans
Bread and butter
Milk
Apple and celery salad

SUPPER

Cream of spinach soup
Scrambled eggs
Cabbage salad Buttered rusks
Milk Orange

III

BREAKFAST

Cornflakes with sliced bananas
Buttered toast
Milk

DINNER

Broth with alphabets
Bacon Baked potato
Shredded cabbage and raw carrot salad
Milk Bread and butter

SUPPER

Cream of pea soup
Baked spaghetti with sliced hard cooked eggs
Fresh tomatoes
Milk Buttered rusks Apple

IV

BREAKFAST

Prune sauce
Oatmeal Milk
Buttered toast

DINNER

Roast beef
Boiled potatoes Creamed onions
Bread and butter
Milk
Apple and raisin salad

SUPPER

Vegetable soup
Baked rice Buttered peas
Raw celery Buttered rusks
Milk Orange

V

BREAKFAST

Fig sauce (without sugar)
Cream of wheat Buttered toast
Milk

DINNER

Broth with macaroni
Fish, creamed sauce
Potatoes boiled with jackets
Buttered spinach Bread and butter
Milk
Shredded cabbage and banana salad

SUPPER

Vegetable soup
Scrambled eggs
Beets and shredded lettuce salad
Buttered toast
Milk Apple

VI

BREAKFAST

Dried peach sauce (no sugar)
Oatmeal
Buttered toast
Milk

DINNER

Meat loaf
Creamed whole potatoes
Buttered rutabagas
Bread and butter
Milk Raw apples

SUPPER

Tomato soup
Cottage cheese Baked potatoes
Raw carrots Buttered rusks
Milk Orange

VII

BREAKFAST

Prune sauce
Shredded wheat Buttered toast
Milk

DINNER

Barley soup
Roast lamb Mashed potatoes
Buttered peas and carrots
Buttered toast
Milk
Fresh fruit salad

SUPPER

Creamed vegetable soup
Baked macaroni with hard cooked eggs
Shredded cabbage and fresh tomato salad
Bread and butter
Milk Apple

(No sugar is used on cereals. Only whole wheat or graham bread is used. Fresh vegetables are used wherever possible.)

DISCUSSION

F. E. Burkett, Birmingham, Ala.: Would it not be better to have the children take more time in chewing their food? That would allow the ptyalin to change the food so that the stomach would digest it more easily, and then there would be a better flow of the pancreatic juice, and so on. Would not that create better enamel, better bone, better muscle, better health for the child?

E. D. Coolidge, Chicago, Ill.: Did Dr. Bunting give us the relation of *B. acidophilus* in the examination of the different types of mouths under the feeding experiments and with the hexylresorcinol?

Weston A. Price, Cleveland, Ohio: Dr. Bunting, would you favor giving these people some of the same material they would get by eating the vegetables and drinking the milk, a little more of that something they are getting out of that milk in a concentrated form, and then let them have a little more leeway with the sugar? I am not advocating the use of sugar. I am simply stressing the fact that there is something those children are getting out of that diet that they must have. They are fortunate in those schools to get dietary products from the milk produced by cattle fed on splendid pastures; and because that thing is working in the Detroit and Ann Arbor districts is no proof at all that the same sort of program will work out just the same in other parts of this country. I am sure it would not.

G. K. Dice, Tipton, Iowa: What is your opinion of honey as a substitute for sugar? Did you eliminate sugar from any of the prescribed diets?

Dr. Bunting (closing): I do not know that I can answer all of the questions which have been raised. I wish that I might, for so many interesting phases of the problem have been brought up. Dr. Coolidge asked about the relationship of *B. acidophilus* in the mouth to our feeding experiments. In many of the children on this diet, the acidophilus bacillus disappeared from the mouth, while in others, the organisms remained, but their growth seemed to be very restricted. There is much still to be learned about the behavior of this organism in the mouth, and the conditions under which it can produce the specific lesion of dental caries. A question was asked relative to the

effect of honey in the diet as a form of sweet. In the first place, I wish it distinctly understood that I am not a nutritionist, nor am I able to discuss the problem of nutrition in an authoritative way. We have recently added to our group an able nutritionist, who will direct the future activities of our work from the nutritional standpoint. It is my opinion that honey is not so significant in the diet as is sugar. Although honey will satisfy the craving for sweets, the average child will not gorge himself on this form of confection. Sugar in the form of candy or highly sweetened foods is so available an energy producing food that excessive amounts may easily be consumed. It is my opinion also that some children have an inordinate desire for sugar which they may have acquired during infancy because they were at that time fed on foods which had a high sugar content. This appetite for sugar may be retained throughout the life of the child. Such children have a craving for candy and sugar that is similar to that of many adults for whiskey. On the other hand, I know of many children who have been reared on foods low in sugar content and who had no candy in their earlier days, who have no desire for it. There are many angles to this candy situation that we cannot consider at this time. Dr. Price raised a question as to whether this form of diet would be equally effective in all parts of the country. I would say that reports have come from dentists all over this country who have examined the teeth of children in orphanages. They state that whenever the diet of the orphanage is well-ordered and adequate for the needs of the child, there is much less dental caries than among public school children in the same communities. There are many factors, of course, which enter into such a consideration; as, for instance, the fact that the children are fed on a uniform diet to which the individual may have powers of adaptation. Furthermore, these children do not get so much candy and sweet foods as do the children outside, as a rule. The evidence all seems to point toward the general proposition that children everywhere who are fed on a well-balanced, well-fortified diet are definitely less susceptible to dental caries than they otherwise might be.

MAKING ROENTGENOGRAPHY EASIER FOR THE GENERAL PRACTITIONER

By E. LESTER JONES, D.D.S., Albany, N. Y.

WHAT is the most important phase of roentgenographic technic? Certainly not the machine, for all machines that are capable of energizing a Coolidge tube are capable of producing shadow detail on a sensitive negative. If we make an exposure, no matter how careful the technic, and stop there, what have we? Absolutely nothing.

We must go farther. In my opinion, the most important step in the whole routine of oral roentgenography is the chemical processing of the negative after the exposure, and where is there anything more abused than the developing of roentgen-ray films? I have seen all types of equipment, from a small light china bowl, tucked away in the corner of the general laboratory, to the more elaborate and complete developing rooms; a solution left exposed to the air for days at a time, no thermometers and the only container for washing the negatives the faucet in the laboratory. It sounds absurd; especially when the developing of a roentgen-ray negative is a very definite chemical process. The wonder is that results are as good as they are. It must be an act of Providence.

It is not fair to our patients to use a haphazard technic. We take these pictures to diagnose their physical ailments. Can pictures developed as they are in 90 per cent of the offices that I have seen tell the story accurately? A pathologic process appears as a variation in shadow detail. Can a negative chemically fogged show this variation? The chemical is only one of the many conditions that we encounter in faulty developing technic. The cure is with ourselves, not necessarily in elaborate equipment, although equipment certainly makes our task easier and more certain, but in attention to details, which, literally translated, means rules and adherence to the fundamentals of chemistry and dark-room technic. It is to offer suggestions and routine measures that will, I hope, help the average dentist in this important phase of roentgenography that this paper is undertaken.

THE DARK ROOM

The laboratory, most assuredly, is no place for the dark room, because of the impossibility of keeping it and the air in it clean. The dark room, of necessity, must have proper ventilation and be free from gases, dust and other things which might contaminate the solutions or, by coming in direct contact with the negatives, exert a deleterious effect. This can not be accomplished in the general laboratory where dentures are filed and polished, bridges soldered, etc., and refuse, old cans, laboratory supplies, drugs and what-not are stored. It is safe to say that 90 per cent of our dark-room trouble comes from dirt, impure water and contaminated air.

If the operator is cramped for room, he can partition one end of the laboratory, but if possible, he should have a separate room, the size of which should be governed by the amount of roentgenography done. This room should be painted black and be absolutely lightproof, and should be equipped with running water, benches and shelves to store only the chemicals and other articles used in photography. Also there should be a bench in which are set the tanks for developing, washing and fixing. At the other end of this bench, a safe light, preferably red, should be installed to facilitate the handling of films preparatory to the developing process. The door on the dark room should be of the sliding type, running in grooves, both top and bottom. This will exclude all the light, dust, etc.

On the wall of the dark room, directly over the bench, I would have racks built to handle or hold intra-oral x-ray hangers, and, if you practice extra-oral roentgenography, hangers for the 5 by 7 and 8 by 10-inch frames, the size depending entirely on the size of the negatives. In one corner, opposite or to the side of and on the bench, place a small electric fan to facilitate drying the negatives. The arrangement of the various pieces can best be made by the operator himself, to suit his own convenience. What is most important is to have a suitable room for photography and nothing else, a room spotless, as far as dust and dirt are concerned, well ventilated and free from contamination of the dental laboratory.

CARE OF THE DARK ROOM

As I said before, cleanliness is the key word in our dark-room technic. The floor should never be swept, always mopped. Sweeping scatters dust to lodge in or on our tanks, negatives, chemicals, etc. The shelves should be wiped off with a damp cloth and not dusted. Solutions which have been spilled in the process of either developing or filling the

tanks should be immediately wiped up or, if left to dry, washed off, both tanks and benches. They are liable to prove quite discouraging annoyances if left to dry, for at the first revolution of the electric fan in the process of drying negatives, the crystals will fly around the room and land on the wet negatives.

I am submitting herewith a plan for a dark room which is inexpensive and, although small, nevertheless practical, convenient and efficient for both the developing of films and the loading of casettes.

The water supply for the tanks comes from a tap on the supply line to the lavatory. The drain hose from the tank leads into the lavatory drain. Note the accessibility of the developing end of the room. After we have the dark room constructed and all in order for developing, etc., it is wise to test it for light leaks and also to know how safe the red light really is. A small intra-oral film is unwrapped and placed on the bench, one half exposed, the other half covered, so as to exclude any light. This is done both with the red light on and with the red light off. The film is allowed to stand for at least two minutes and is then developed. If the exposed end develops clear and shows absolutely no fog, the dark room and lights are safe. If there is the slightest difference between the exposed and unexposed ends of the films either the dark room is unsafe or light is leaking in. Probably, the fault is with the red light, for no light can with absolute safety be held too close to the negatives.

SOLUTIONS

It is not best to compound our own fixing and developing solutions from materials bought in bulk, because it is next to impossible, without elaborate equipment and expert knowledge of chemicals, to determine their purity. The manufacturers of these products make them for use as cheap, if not cheaper, than we could possibly obtain them and with a much greater degree of accuracy for the accomplishment of the particular task for which they are intended.

In compounding the solutions, we should be especially careful in following the directions given on the cartons by the manufacturers. There is a specific reason for advising that the water be a certain temperature, how the powder should be added, etc., and if these directions are disregarded, the operator's carelessness is evident in a faulty developed negative.

One cannot be too careful in mixing the solutions. Tap water should never be used for either fixer or developer. To purify the water, most cities use chlorin, and this chemical is quite detrimental, entering into the chemical reaction which takes place between the negatives and solutions in both developer and fixer, and causing a peculiar chemical fog, particularly if the chlorin is present in noticeable amounts. Then, too, animal and vegetable matter appearing in almost all city water is an undesirable addition. Distilled water, which is easily obtained and quite inexpensive, should be used. The rinsing process may be done with tap water, without any harm.

It is not only interesting but also imperative that we know something of the chemicals that make up the developing and fixing solution. The formulas for the developing solution, for the most part, contain elon (a substitute for metolm, a German product which is no longer obtainable), sodium sulphite, sodium carbonate, potassium bromid and hydrochinon (Eastman).

A negative, as we use it, is a piece of celluloid covered with a layer, about one-

thousandth inch thick, impregnated with silver bromid salts. The roentgen-rays penetrating the plate or negative produce an image on the silver bromid, which is very sensitive to light. The exposed film is placed in the developer to be developed or, more properly, reduced, for the developer is really a reducing agent, the silver bromid being reduced to a metallic silver by the elon.

The elon or metol hydrochinon is not sufficiently energetic to penetrate the emulsion and so some chemical which has the power to open the pores of the gelatin and allow the reducing agents to penetrate and do their work must be added. This is an alkali, usually sodium carbonate. It is spoken of as an accelerator because it hastens the action of the reducing agent. The developer as it now stands has a great affinity for the oxygen in the air, and if no other chemical were added, it would soon oxidize itself and lose its reducing power. Therefore, sodium sulphite, a chemical which has a great affinity for oxygen without hindering the work of the other chemicals, is added. A developer containing two reducing agents, the alkaline and the sulphite, may be so strong that there is some danger that it will produce a chemical fog over the entire film; therefore, to restrain the activity of the developer, a few grains of potassium bromid is added.

FIXING SOLUTION

Fixing solution is made from the following: sodium hyposulphite, or hypo, sodium sulphite, potassium chrome alum, sulphuric acid and water. Let us see what these various ingredients do and why. Sodium hyposulphite, or hypo, is a solvent for the silver bromid and is used to dissolve the unexposed and undeveloped particles of silver bromid. The sodium sulphite is a preservative and is used to keep the solution in a staple condition. Potassium chrome alum is an astringent and is used to harden or toughen the emulsion. Sulphuric acid is used to prevent the solution from becoming alkaline owing to the developing solution's being carried over on the film. In other words, the fixing solution fixes or sets the image which has been reduced by the developer.

The developing and fixing solutions deteriorate in direct proportion to the amount of work that they are called on to do. They will also deteriorate from exposure to the air whether used or not. It is safer and cheaper to mix and use new solutions more frequently than to work with one of questionable character.

Even with the addition of sulphuric acid to the fixing solution, the developing solution will ultimately have a neutralizing effect on the fixing solution. It is therefore necessary that the negative be washed in water before it is put in the fixer. This is quite an important factor in the ultimate success of the chemical processing of the negatives because, as I am trying to bring out, the roentgenographic product is in direct proportion to the care which is given the minor details.

It is apparent that the development of roentgenograms is a very definite chemical proposition. Chemistry, of course, is an exact science, and therefore we must be exact in our details of procedure. Elon, we are told, is the important ingredient of the developing solution. It is ineffective below 60 or above 75 degrees. The manufacturers of all developers advise their use at 65 degrees. This does not mean 60 or 68; 65 is the temperature at which all the ingredients of the solution, particularly elon, work perfectly. Knowing this to be true, we should be absolutely certain of the temperature of the developer.

At the correct temperature, it takes a definite length of time for the chemical process to be completed. Five minutes at 65 degrees is the rule. I shall not go into detail as to the visual or tray method of development, for I believe that it has no place in dental roentgenography. The tank method, if used according to instructions, is positive and "foolproof." The only extra equipment needed besides the tank is a thermometer and a time clock. By all means, a thermometer! We should no more attempt to develop a negative without knowing the temperature of the solution than we should make an exposure without knowing the spark gap and the milliamperage of our machine.

The fixing of negatives should take about three times as long as the developing, say about fifteen minutes, and the temperature of the solution should be the same as that of the developing solution. As I said before, the films should be rinsed before being placed in the hypo. This extends the life of the hypo and tends to minimize chemical artefacts. The washing process should take at least one-half hour in running water, and the temperature of the water should never be allowed to go above 65 degrees, better lower than higher. Warm or hot water will swell the emulsion and ruin the negative.

Now let us look at some of the effects of poor technic in the dark room:

1. Underdevelopment of negatives, caused by (a) the solution's being too weak or too cold; or (b) the negative's not being left in the solution long enough to consummate its reducing action. Both these faults could be overcome by the use of a thermometer and a time clock, developing by rule, not guess.

2. Overdevelopment of negatives, caused by (a) the solution's being too warm or (b) improperly compounded; or (c) the negative's being left in too long.

3. Bulging or swelling and cracking of the emulsion because the solution is too warm, usually over 75 degrees.

4. Chemical fog, appearing as a light shade of gray. This is usually caused by (a) too long development; (b) improper mixing of the solution; (c) low temperature of the developing solution.

5. Chemical stain, a discoloration, other than black, which appears on the film. This is caused by (a) oxidization of the developer from exposure to the air; (b) developing at too high a temperature; (c) insufficient rinsing; (d) use of an old, worn out solution.

I have listed only five effects of the lack of attention to details in dark-room procedure. They are the most common to be sure, and the easiest to correct. The rule to be followed is: Develop at 65 degrees for five minutes. There is only one way to know when the temperature of the solution is 65 and that is by the use of the thermometer, and only one way to know that the negatives have been sufficiently subjected to the chemical actions of the reducing solution and that is by the use of the time clock. The dark room technic must be systematized and standardized. Ninety-nine times out of a hundred, the x-ray machine is all right, and poor negatives are the result of haphazard procedure in the dark room.

CONCLUSION

1. A room should be set aside for photographic purposes exclusively. It should be clean, dust free and light proof, with running water and just enough storage room to accommodate photographic necessities. It should be sufficiently equipped, not necessarily elaborate.

2. Chemicals should not be bought in bulk.

3. In mixing solutions, the manufacturer's directions must be followed precisely.

4. Distilled water should be used in mixing both developer and fixer.

5. A thermometer is an essential.

6. The temperature for development is 65 degrees—and no other.

7. A time clock is an essential.

8. Development shall continue for five minutes, and no longer, at 65 degrees.

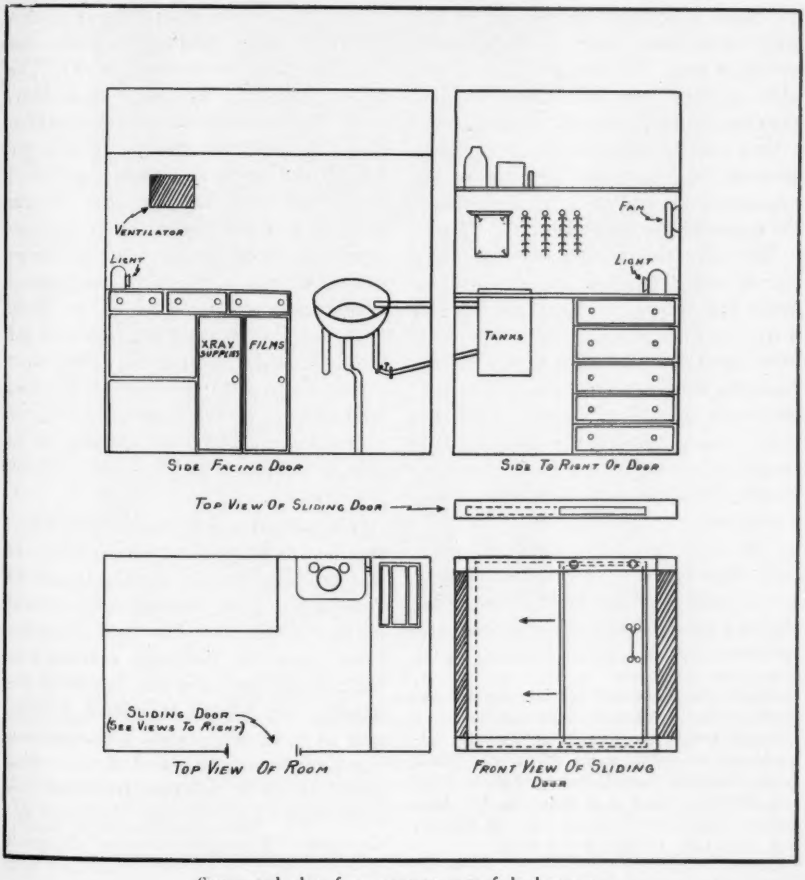
9. Films are rinsed before being placed in the fixer.

10. The solution is kept at 65 degrees and fixing continues for at least 15 minutes.

11. Running water, free from dirt and oil, is used for rinsing.

12. Pure, warm, circulating air, agitated by an electric fan, is used for drying.

75 State Street, Albany, N. Y.



Suggested plan for arrangement of dark-room.

HISTOLOGIC STUDY OF A CASE OF EXTENSIVE ROOT RESORPTION IN A HUMAN BEING*

By EMIL MUELLER, D.D.S., M.S., F.A.C.D., Chicago, Ill.

ALTHOUGH many cases of root resorption have been described, this is, as far as we know, the first case in which it was possible to study the rapid process of destruction in the same individual over a considerable period of time. Particularly was it possible to obtain material for histologic examination from time to time, so that a very good comparison could be made between the conditions recorded in the roentgenogram and the actual progress of the resorption in the patient.

The clinical investigations that were carried out at the time the patient came under our observation were described in THE JOURNAL.[1] Since that time, two more specimens, including teeth with surrounding soft and hard tissues, have been obtained. The first, consisting of two teeth, was obtained six weeks, and the second, consisting of one tooth, about six months, after the medical treatment was undertaken.

The first histologic specimen previously described showed every evidence of a resorption process rapidly destroying the hard substances of the teeth; the next specimen showed both an arresting of the process and the beginning of repair; the last specimen showed nothing but repair taking place on all surfaces previously injured.

Before a detailed description of the different histologic findings is given, the case history will be reviewed briefly. The patient came to us the latter part of May, 1929, for diagnosis of a mouth condition that had up to that time resulted in the loss of nine teeth, all within a period of considerably less than one year. It was quite evident that if the destruction continued, all the teeth would, within a brief period of time, be lost. A thorough dental examination was made. Early in June, an upper first bicuspid was removed for histologic study. Fortunately, there were roentgen-ray pictures available that had been taken at various intervals during the previous year, and these enabled us to gain some idea as to the rapidity of the process.

The patient was at once subjected to a very extensive physical examination. It was believed that if anything could be done, it would be through some general physical treatment. The final diagnosis, based upon the foregoing examination, was: general neurasthenia, vasomotor instability and hepatic functional disturbance of unknown origin. This examination extended over a period of two weeks, July 1-16, 1929. Systemic treatment was undertaken, July 18, and continued for six weeks. Roentgenograms of the teeth

*From the Research Department of the Northwestern University Dental School.

*Read before the Section on Biologic Sciences and Research at the Midwinter Clinic of the Chicago Dental Society, Feb. 3, 1931.

1. Mueller, Emil, and Rony, H. R.: Laboratory Studies of Unusual Case of Resorption, J.A.D.A., 17:326 (Feb.) 1930.

were taken at frequent intervals in order that changes occurring during the time of treatment might be observed. The systemic treatment, a low protein, low caloric diet consisting chiefly of milk, vegetables and fruits, was prescribed. Simultaneously, a heteroprotein therapy was applied, consisting of intermuscular purified sterile casein injections, given twice weekly. These injections were very well tolerated by the patient and were unaccompanied by any local or general reaction. After six weeks, the patient lost 8 pounds. She continued to feel very well.

Another blood examination, after the six weeks' treatment, revealed a negative direct and indirect van den Bergh reac-

Fig. 1.—A longitudinal section of bicuspid which was removed about a month before systemic treatment was undertaken. The general view shows that the process undermined the dentin as well as the enamel. Resorption of the enamel has taken place only in those locations where it was not protected by epithelium. *a*, space previously occupied by enamel; *b*, dentin; *c*, area of resorption of dentin. *d* to *e*, line indicating approximately the previous dentino-enamel junction. The region beyond the line represents the amount of enamel resorbed. The roentgenograms with this photomicrograph show the condition of this bicuspid at different periods before the extraction.

tion and an icterus index of 7. The levulose test was still positive as the first two specimens of urine voided at one and two hours after injection of the levulose showed a slight trace of sugar. The glucose tolerance test was negative. These changes, in our opinion, probably indicate that the liver function improved during the treatment. Within a very short time after medical treatment was undertaken, the roentgen-ray pictures, which were taken at frequent intervals, showed no further change in the resorption process; on the contrary, reasonably soon thereafter, the previous defects appeared to become less defined, which suggested filling in by a radiopaque substance. This was later conclusively confirmed in the histologic findings from the last specimen.

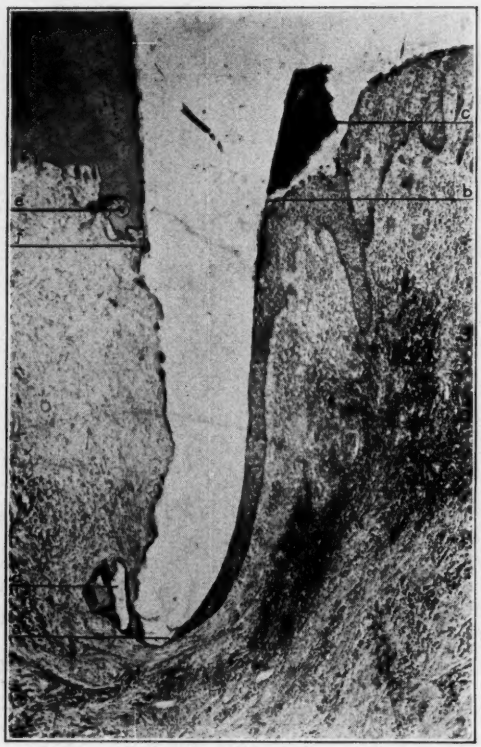


Fig. 2.—A higher magnification from the same series as Figure 1; showing a more detailed picture of the enamel space and adjoining structures. The enamel ended approximately at *a*. The bottom of the crevice was at *b*. The epithelium from *a* to *b* constituted the epithelial attachment. Tartar (*c*) filled the crevice. The fragment of enamel and dentin *d* is being surrounded by epithelium. Resorption of dentin by osteoclasts is evident at *e*; osteoclast passing from dentin into enamel at *f*.

It may be opportune at this point to discuss what connection there was between the repair and the treatment in-

stituted. While it is quite apparent that one case of this nature is not a sufficient basis for definite conclusions concerning this particular point, cases have been seen roentgenographically in which similar resorption of unknown origin became arrested without any known cause. Therefore, a mere timely coincidence between

system with different types of general physical disturbances of the metabolism (Becks, Citron, Flacher, Gold, Hoffstrom, Leopold, Oppel, Weinmann). Weinmann[2] has recently shown that in diffuse atrophy cases—and evidently, our case belongs to this group—there is a definite deviation in the blood chemistry

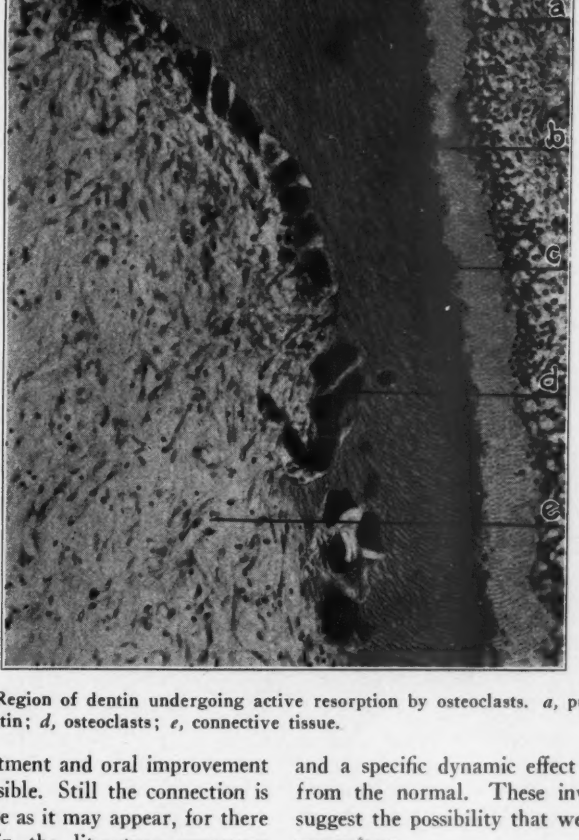


Fig. 3.—Region of dentin undergoing active resorption by osteoclasts. *a*, pulp; *b*, dentinoid; *c*, dentin; *d*, osteoclasts; *e*, connective tissue.

medical treatment and oral improvement is not impossible. Still the connection is not so remote as it may appear, for there are found in the literature numerous authentic investigations that have shown the varied interdependence of the tooth and a specific dynamic effect of protein from the normal. These investigations suggest the possibility that we should be

2. Weinmann, J.: Stoffwechseluntersuchungen bei der diffusen Atrophie des Alveolarfortsatzes, Ztschr. f. Stomatol., 12:1154, 1930.

able to influence such cases by causal therapy. Future study of similar cases may reveal that the result of this treatment was more than a mere timely coincidence.

The histologic discussion which is to follow will be limited to an actual description of findings. An attempt will be made to refrain from indulging in speculations, even though the material does offer an excellent opportunity for a discussion of the much disputed question of all resorption being caused by local inflammatory processes, as well as of the influence of calcification on the resorption of hard substances.

In Figure 1 is offered a general histologic picture of the bicuspid extracted in June, 1929, a little more than a month previous to the time systemic treatment was undertaken. At this time, the tooth was undergoing very active osteoclastic resorption. The three succeeding photomicrographs offer a more detailed picture of the area of resorption. It was not possible, during clinical examination, to insert an explorer sufficiently deep into the crevice to hook it under the edge of the enamel. In a section from the same series (Fig. 2), it is possible to study quite accurately the conditions that existed at the time. The epithelium was attached to the surface of the enamel over a considerable distance (*a* to *b*). Tartar filled the crevice to the bottom, which is found at *b*.

Fig. 4.—Higher magnification of areas *e* and *f*, Figure 2. *a*, osteoclasts in dentin; *b*, osteoclast passing from enamel into dentin.

Fig. 5.—Longitudinal section of both lower cuspid and first bicuspid extracted six weeks after medical treatment was undertaken. *a*, region undergoing repair; *b*, area of resorption; *c*, epithelium growing into tissues occupying resorbed areas. The roentgenograms with this photomicrograph show the progress of the resorption process on these teeth.

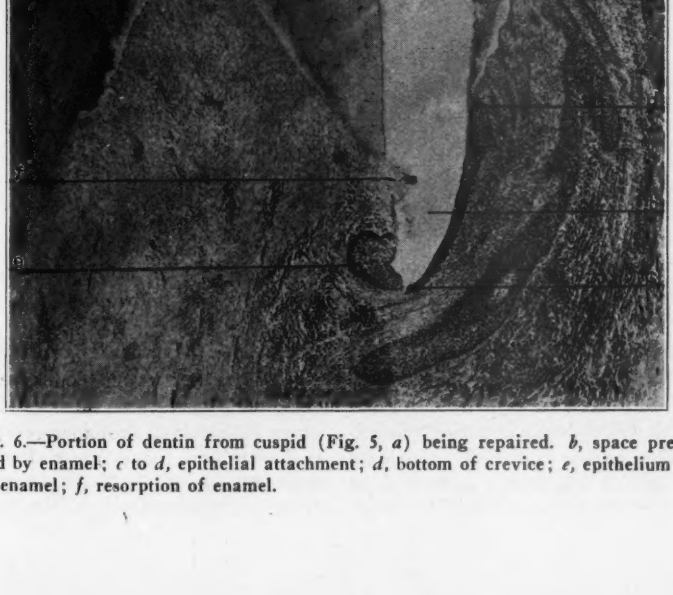


Fig. 6.—Portion of dentin from cuspid (Fig. 5, *a*) being repaired. *b*, space previously occupied by enamel; *c* to *d*, epithelial attachment; *d*, bottom of crevice; *e*, epithelium undermining enamel; *f*, resorption of enamel.

After the resorption process had passed the dentino-enamel junction, resorption of both the enamel and the dentin proceeded simultaneously. As soon as the dentin underlying the enamel was resorbed, the epithelium proliferated and began to grow up under the enamel to cover the inner surface. The fragments of enamel and dentin (*d*) were in all probability fragile pieces that were broken off because of the movement that this tooth was undergoing during mastication. This picture shows the resorption of the enamel and dentin as well as of the granulation tissue underlying it. A higher power photomicrograph (Fig. 3) shows the very active resorption which the dentin was undergoing. A more detailed picture showing osteoclasts at work in both the enamel and the dentin can be seen in Figure 4.

Approximately six weeks after systemic treatment was undertaken, the lower left cuspid and first bicuspid with surrounding tissues were removed. Figure 5 is a gross longitudinal histologic section of both teeth with tissues intact. Resorption was still active at some points; other

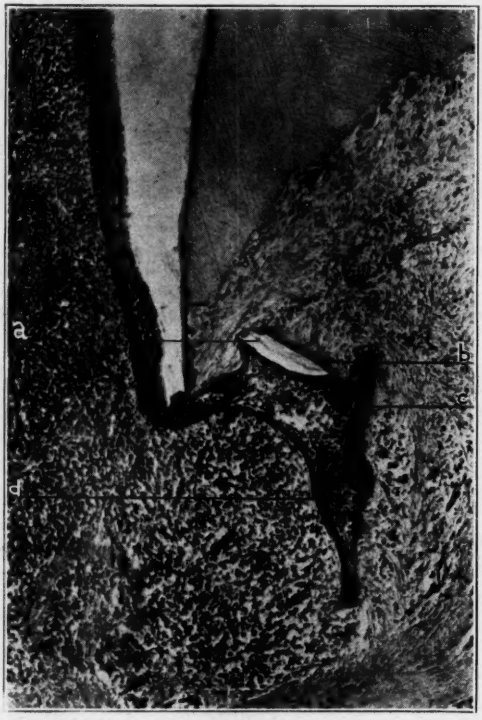


Fig. 7.—Section showing piece of enamel with fragment of cementum and dentin misplaced. It is being surrounded by epithelium. *a*, enamel; *b*, dentin; *c*, cementum; *d*, epithelium.

areas were inactive, and, in many other areas, repair was taking place. This finding was as suspected from the roentgenograms, since, in all films taken after treatment was undertaken, it appeared that the progress of resorption had been slowed down or had become inactive.

Previous to the time of treatment, progress in the resorption process could be noted with each succeeding roentgenogram. It was possible during clinical examination of the lower left cuspid and first bicuspid (Fig. 5), to hook the explorer under the lower edges of the enamel on both the mesial surface of the cuspid and the distal surface of the bicuspid. The histologic specimen shows the reason for this: the epithelial attachment had passed beyond the enamel surfaces and proliferated well into the resorbed areas. At the interproximal space, the conditions of the crevices were quite normal. The distribution of the tartar marked clearly the location of the crevices. The epithelium in the case of both enamel surfaces was still attached to the undermined enamel.

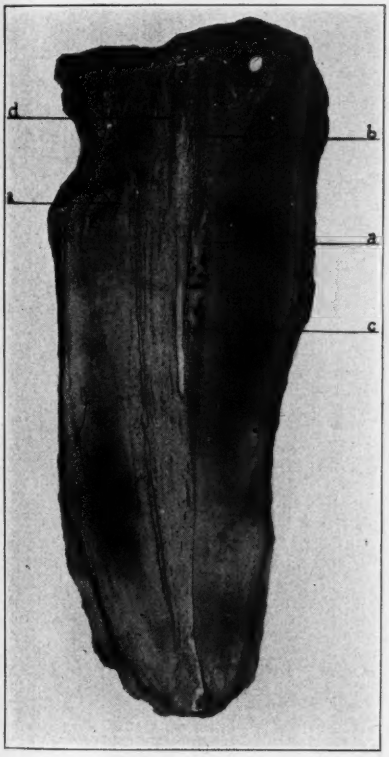


Fig. 8.—Longitudinal section from root of lower cuspid, showing progress of resorption as well as most recent repair. *a*, region being repaired; *b*, unresorbed dentinoid; *c*, area showing how resorption passed along the dentinoid toward apex; *d*, normal pulp.

A higher magnification of one of the regions undergoing repair is shown in Figure 6, taken from point *a*, Figure 5. An interesting finding is portrayed in Figure 7. The lowest edge of enamel, together with a portion of dentin and cementum, has been broken off and become displaced. It is being surrounded by epithelium and thus protected from the connective tissue against further resorption.

The resorption that we have seen in the roentgenograms and have studied histologically was pretty well confined to the upper portions of the roots of the teeth affected. The section of the root, the root portion of the lower cuspid, offered in Figure 8, is typical of the others studied. It is interesting to note the progress of resorption throughout the entire thickness of dentin, with the exception of the dentinoid, which, for some reason, remained almost uniformly undisturbed. A higher magnification from the same root series shows a long piece of unresorbed dentinoid as well as a small spicule of dentin being repaired (Fig. 9).

The next section was taken from a tooth extracted a little more than five

months after the extraction of the two teeth described in Figure 5. During this time, no further medical treatment was in progress. When the roentgen-ray picture taken in February, 1930, is compared with the previous roentgenograms, of October, 1929, it is at once apparent that the resorption areas are less defined, smaller and a little more dense. As expected, the histologic finding again corroborated this supposition. We were fortunate in being able to remove this whole tooth, with all the important surrounding tissues, without fracturing it. This was no doubt possible because of the extensive repair that had taken place in the tooth. This tooth (Fig. 10), which was extracted six months after treatment was started, shows quite a different picture from those previously studied. Resorption has practically ceased and rather extensive repair was in progress on all previously injured surfaces.

Fig. 9.—Higher magnification, taken from the same series as Figure 8. *a*, dentinoid; *b*, primary dentin; *c*, lost dentin being covered by newly built cementum; *d*, an osteoclast at work.

It may seem quite unbelievable that this amount of damage was not detectable on clinical examination. The gingival

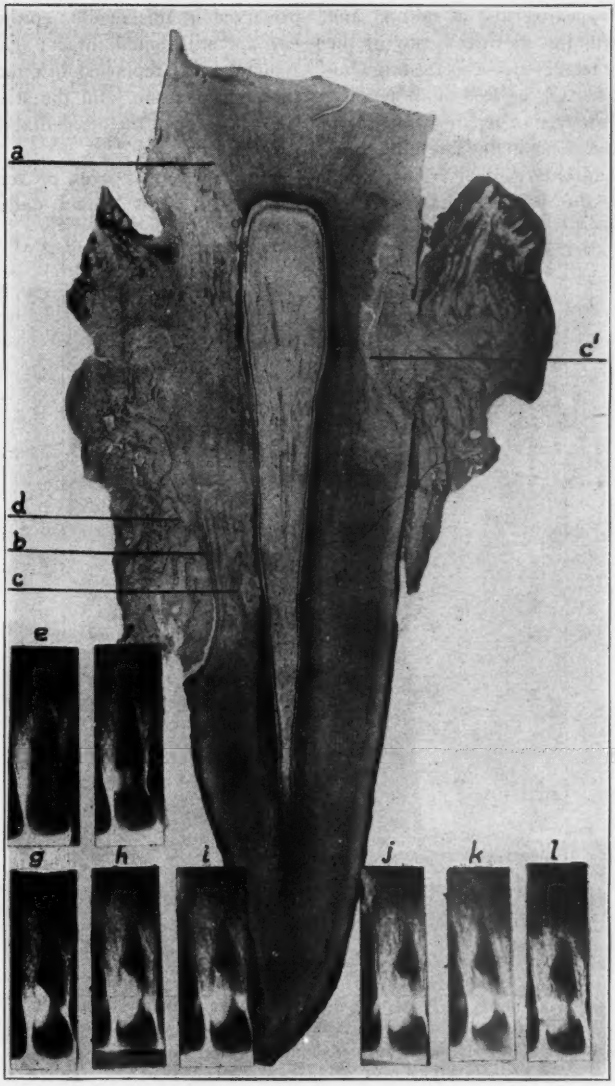


Fig. 10.—Lateral incisor extracted six months after medical treatment was begun. *a*, repair of dentin and enamel by cementum in coronal portion; *b*, peridental membrane dipping into previously resorbed area; *c*, cementum replacing lost dentin; *d*, alveolar bone replacing some of lost structures. The roentgenograms show the progress of resorption. *e*, taken 1-19-29; *f*, 3-6-29; *g*, 5-27-29; *h*, 7-20-29; *i*, 7-31-29; *j*, 8-17-29; *k*, 10-2-29; *l*, 2-21-30.

soft tissue appeared just as normal and the tooth was just as firm as any of the neighboring teeth. In the succeeding photomicrographs will be seen more detailed pictures of the type of repair taking place in different regions of this lateral incisor. Figure 11, an enlargement from area *a*, Figure 10, shows the replacement by preserved in this region; epithelial rests *(e)* are still found intact; the bonelike structure *(a)* replacing lost tooth structure is cementum, and the structure on the other side of the peridental membrane is bone *(d)*.

Another similar area of repair from Figure 10, *c'* is shown under higher

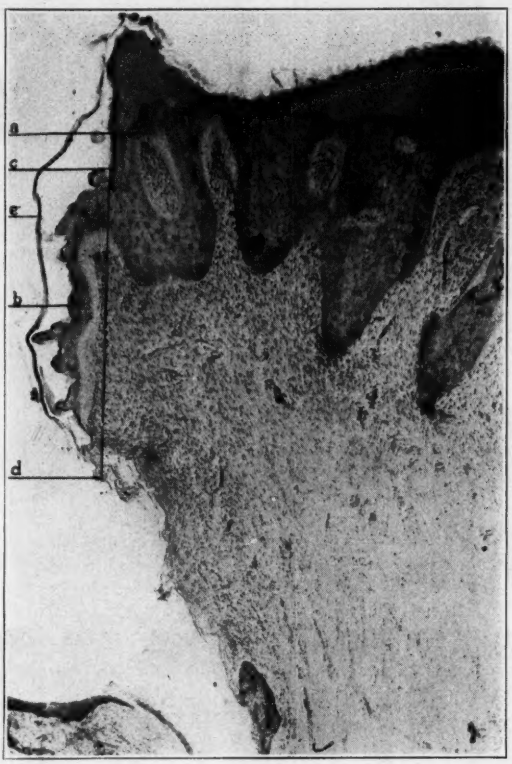


Fig. 11.—Cementum inside of crown, replacing previously resorbed dentin at *a*, enamel at *b*. *c* to *d*, approximate location of former dentino-enamel junction. *e*, cuticle.

cementum of the previously resorbed dentin *(a)* and enamel *(b)*. The basis for the assumption that this is cementum is found in Figure 12, taken from area *b*, Figure 10. The peridental membrane *(b)* is well

magnification in Figure 13. A small portion of dentin *(a)*, with overlying cementum, is still continuous with the root portion *(d)* of the lateral incisor. This is serving as a basis for repair. The peridental

membrane separates the alveolus from the tooth proper. There is no union between tooth and alveolus anywhere. It may be interesting in this connection to know that in the reparative phase, there was no growing together of tooth and bone at any point. A peridental space was maintained all around the tooth, probably because of the fact that the crown was intact, and the tooth was therefore exposed to a constant functional stimulus, which prevented it from becoming ankylosed.

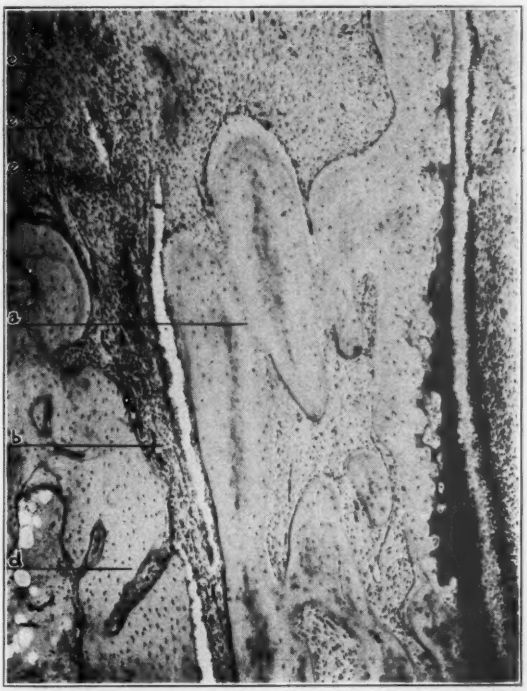


Fig. 12.—Higher magnification from region *b*, Figure 10. Cementum is replacing lost dentin *a;* peridental membrane (*b*) separates tooth from alveolus (*d*). *e*, epithelial rests.

SUMMARY

1. In May, 1929, the patient came to us for an examination of a mouth condition which had resulted in the loss of nine teeth in less than a year.

2. In June, an upper first bicuspid was extracted for histologic study. Upon the basis of the dental examination and history offered up to that time, it was decided to subject the patient to a thorough medical examination and if any irregularities were discovered, to treat them with the hope of benefiting the patient.

3. July 18, 1929, medical treatment was undertaken, which was continued for six weeks. During this time, frequent roentgenograms were taken in order to observe the progress of the tooth resorption.

4. After six weeks, medical treatment was discontinued, and the lower left cuspid and bicuspid were extracted. These showed an arresting of the resorption with considerable repair of the injured hard tissues.

5. Feb. 21, 1930, the upper left lateral incisor with all investing tissues was removed. It showed, on histologic examination that all resorption had ceased, and that extensive repair was taking place on all surfaces previously resorbed.

Fig. 13.—Higher magnification of *c'*, Figure 10. *a*, small fragment of primary dentin with cementum, which remained unresorbed and was still attached to the root portion (*d*) through the medium of a thin layer of cementum (*c*).

A CRITICAL REVIEW OF THE CONTROVERSY CONCERNING METABOLISM IN THE ENAMEL*

By SAMUEL W. CHASE, Ph.D., Cleveland, Ohio

THE controversy concerning the question as to whether the enamel remains vital and concerned with the metabolic processes of the body after it loses its connection with its enamel organ, or remains merely a lifeless, inert substance influenced only by extraneous chemical or physical processes, is by no means new. Since Hoppe-Seyler's[1] demonstration of a change in the birefringence of young and older enamel in 1862 and Linderer's discovery of the enamel tufts and the statement of his belief that they are concerned with transfer of fluids from the dentin to the enamel, in 1867 (cited by Kantarowicz[2]), the question has been argued pro and contra almost constantly. This has resulted in the accumulation of a bulky, unwieldy mass of literature containing the most diverse expressions of opinion. That the subject is gaining in interest is shown by the fact that fifty-seven of the 136 papers selected for consideration from a much larger literature have appeared during the past five years, and that sixteen of the fifty-seven appeared during 1930.

Obviously, in a paper of this sort, it is an impossibility to present any detailed account of such a mass of literature; hence, I have selected only the most pertinent bits of evidence and the bare conclusions from the papers considered and, furthermore, have classified and condensed this information to allow its presentation within my time limit.

Since vitality is an attribute of protoplasm alone, in order to prove vitality of a substance it is necessary to demonstrate for the substance, first, the presence of protoplasm, and, secondly, the presence of certain fundamental properties of protoplasm associated with the living state. These fundamental properties are:

1. *Metabolism.* — The definition of metabolism includes the constructive and destructive physicochemical processes of living protoplasm. Constructive processes, grouped together under the term anabolism, include essentially the absorption of relatively simple food materials, oxygen and water, and their transformation into complex protoplasm or its products. Destructive processes, collectively catabolism, include the conversion of matter, especially protoplasm, into a lower state of organization, always accompanied by the production of carbon dioxid and nitrogenous compounds as waste by-products.

*From the Laboratory of Histology and Embryology, Western Reserve University.

*Read before the Section on the Biologic Sciences and Research at the Midwinter Clinic of the Chicago Dental Society, Feb. 3, 1931.

1. Hoppe-Seyler, F.: Untersuchungen über die Constitution des Zahnschmelzes, Arch. f. path. Anat. u. Physiol., 24:13-32, 1862. (The following references were not consulted in the original: Footnotes 24, 41, 42, 46, 59, 60, 64, 70, 71, 74 and 111.)

2. Kantarowicz, Alfred: Ueber die Ernährung des Schmelzes, Deutsch. Monatschr. f. Zahnheilk., 31:925-947, 1913.

2. *Growth.* — In the case of organisms, except in the case of calcified tissues, increase of size by interstitial growth is implied. Accretional growth of a sort is found during formative stages of calcified tissues, but always with a protoplasmic fundament for the materials added by accretion.

3. *Self-Repair.*—Replacement of newly formed protoplasm for that destroyed by injury or other agency constitutes self-repair. Regeneration always involves cellular activity.

4. *Reproduction.*—This is not necessarily involved in certain tissues after their histogenesis, and is not essential in connection with our problem.

5. *Irritability.*—All living protoplasm exhibits power of response to stimulus to a greater or less degree.

6. *Contractility.* — Aside from the purely physical property of expansion and contraction with change of temperature, all living protoplasm possesses the property of a greater or less degree of contractility in response to a proper stimulus.

7. *Respiration.*—All living protoplasm, no matter how low the rate of metabolism, takes in oxygen and gives off carbon dioxid. Respiration is really associated with metabolism, but is probably the most fundamental test for life available to us.

DEMONSTRATION OF POSSIBLE PATHWAYS OF ASSIMILATION

Most of the investigations regarding the question of the vitality or nonvitality of the enamel have been aimed directly or indirectly at the demonstration of possible metabolic activity of this tissue. The indirect method of approach has involved chiefly the demonstration of the location of the minute amounts of organic substance present in enamel, and thereby the demonstration of potential pathways of assimilation.

The earliest work of this sort was that of Linderer, in 1867 (cited by Kantarowicz[2]), who first described the enamel tufts and speculated on the possibility of their serving as a means of transfer of fluids from dentin to enamel. The demonstration, by C. F. W. Bödecker[3] and Abbott,[4] of a fibrous meshwork continuous through all the hard tissues of teeth was later shown to be due to artefacts obtained by their use of chromic acid, but this work proved a tremendous stimulus to future investigations on the subject.

Later investigations have been concerned largely with certain elements of the enamel which have often been mentioned as forming a mechanism for fluid transfer. The structures which form possible pathways will be discussed singly as follows:

1. *The Enamel Spindles.*—Regarded by von Ebner[5] as dried or shrunken parts of the interprismatic substance, by Paul[6] as imperfectly calcified predentin, by Walkhoff[7] as remnants of absorption, by the ameloblasts, of the first layers of dentin, and by Römer[8] as nerve end-organs, their connection with the dentinal tubules was probably first adequately

3. Bödecker, C. F. W.: Heitzmann: Mikroskopische Morphologie, Vienna, 1883.

4. Abbott, F.: Contribution to Study of Minute Anatomy of Enamel, Dent. Cosmos, 29:254-266 (April) 1887.

5. V. Ebner, V.: Strittige Fragen über den Bau des Zahnschmelzes, Sitzungsb. d. k. Akad., 99:57-104, 1890.

6. Paul, F.: Some Points of Interest in Dental Histology; Enamel Organ, Dent. Rec., 16:493-498, 1896.

7. Walkhoff, O.: Beiträge zum feineren Bau des Schmelzes und zur Entwicklung des Zahnbeins, Deutsch. Monatschr. f. Zahnheilk., 16:1-16, 1898.

8. Römer, O.: Nerven im Zahnbein: Zahnhistologische Studie, Freiburg, 1899.

demonstrated by Caush,[9] by fuchsin staining. Kato[10] regarded them as penetrating the whole thickness of the enamel, and Fischer[11] and Bödecker[12] made them part of a continuous organic tract from the odontoblastic processes to the prism sheaths; a view which has been voiced by others. Kantarowicz[2] believed Fischer's opinion incorrect, since the spindles rarely run parallel to the prisms. Lams'[13] explanation of their origin by growth of odontoblastic processes through the ameloblastic layer previous to dentinogenesis is by far the most logical explanation advanced and is ably supported by his actual observation of this relation in stained sections. Certainly, their limited and variable distribution is strongly against consideration of these structures as normal pathways of fluids to the enamel.

2. *The Enamel Tufts.*—Concerning these structures very diverse views have been expressed. Weidenreich[14] and his students considered them odontoblastic processes. Linderer, as above mentioned, believed them pathways of transfer of fluid into the enamel, a view with which Bödecker[15] and many others concur. The majority of investigators, e. g., Kantarowicz,[2] Orbán,[16] Brammer and Brauer,[17] Van Kirk,[18] Schöttl,[19] Faber[20] and Brammer,[21] have been convinced that they are faultily calcified prisms. Miller,[22]

9. Caush, D. E.: Notes on Enamel, Tr. Odontol. Soc. Great Britain, 36:155-177 (1903; Brit. J. Dent. Sci., 36:433-442, 1903.

10. Kato, S.: Histological Study on Human Enamel, Dent. Cosmos, 71:1139-1151 (Dec.) 1929; 72:8-19 (Jan.) 1930.

11. Fischer, G.: Bau und Entwicklung der Mundhöhle des Menschen unter Berücksichtigung der vergleichenden Antomie des Gebisses und mit Einschluss der speziellen mikroskopischen Technik, Leipzig, 1909.

12. Bödecker, C. F.: Permeability of Enamel in Relation to Stain, J. A. D. A., 10: 60-63 (Jan.) 1923.

13. Lams, H.: Histogenèse de la dentine et de l'émail chez les mammifères, Compt. rend. Soc. Biol. 83:800-802, 1920.

14. Weidenreich, F.: Ueber den Schmelz der Wirbeltiere und seine Beziehungen zum Zahnbein, Ztschr. f. Anat. u. Entwickl., 79: 292-351, 1926.

15. Bödecker, C. F.: Eine Entkalkungsmethode für Gewebe welche wenig organische Substanz enthalten, insbesondere Zahnschmelz, Ztschr. f. wiss. Mikrosk., 22:190-192 (Plate II), 1905; Vorläufige Mitteilung über organische Gebilde im menschlichen Zahnschmelz, Anat. Anz., 34:310-314, 1909; Nutrition of Enamel of Human Teeth, Dent. Cosmos, 53:1000-1011 (Sept.) 1911.

16. Orbán, Bálint: Zur Entwicklung und feineren Struktur des Schmelzes, Ztschr. f. Stomatol., 23:599-622, 1925.

17. Brammer, F., and Brauer, K.: Ueber organische Substanz im Schmelz menschlicher Zähne, Deutsch. Monatschr. f. Zahnheilk., 44:473-494, 1926.

18. Van Kirk, L. E.: Frequency of Occurrence of Certain Structural Variations in Human Enamel, Dentine and Cementum, J. Dent. Res., 8:459-461 (June) 1928.

19. Schöttl, O.: Die feinere Struktur des Schmelzes der Beutelratte, Inaug. Diss., Würzburg, 1928.

20. Faber, F.: Schmelzsprünge, Ergebn. d. ges. Zahnheilk., 7:106-134, 1924; Die Schmelzsprünge in ihren Beziehungen zu traumatischen Einwirkungen, Ztschr., f. Stomatol., 22:47-56, 1924; Zur Frage nach dem Leben des menschlichen Zahnschmelzes, Ztschr. f. Stomatol., 22:663-682, 1924; Die Lamellen des Zahnschmelzes, Deutsch, Monatschr. f. Zahnheilk., 43:354-357, 1925; Das organische Gewebe des menschlichen Zahnschmelzes, Ztschr. f. Anat. u. Entwickl., 86: 1-70, 1928.

21. Brammer, F.: Ueber Lamellen und Büschel im Schmelz menschlicher Zähne, Deutsch. Monatschr. f. Zahnheilk., 48:753-764, 1930.

22. Miller, W. D.: Presence of Bacterial Plaques on the Surface of Teeth, and Their Significance, Dent. Cosmos, 44:425-446 (May) 1902.

Hauser,[23] Gräff[24] and Akamatsu[25] believed that they are seen in ground sections as cracks, Gräff ascribing as their cause the traumatism of the extraction forceps and Akamatsu showing quite convincingly that most of them arise during the grinding and polishing of sections. All of these last four investigators believed that the cracks arise in regions of imperfect calcifications, which form regions of predilection for the cracks. Akamatsu's contention that significantly fewer tufts are found in sections ground with extreme care than are present in sections ground by the more ordinary methods is at present under investigation by me, with early results pointing toward confirmation of Akamatsu's claims. At least, there appears to be practical agreement that the tufts are faultily or incompletely calcified regions of the enamel, probably involving the prisms. This being the case, and in view of their irregular distribution and occurrence, they are scarcely to be regarded as normal structures.

3. *The Enamel Lamellae.*—Concerning the enamel lamellae, the expressions of opinion have been of nearly the same nature as those for the enamel tufts. Weidenreich[14] thought them of dentinal origin. Gottlieb,[26] Orbán,[27] Kronfeld[28] reported at least some lamellae originating from extraneous tissues. Bödecker,[29] Meyer,[30] Orbán,[27] Brammer and Brauer,[17] Kronfeld,[28] Schöttl[19] (some of them) and Brammer[21] all considered them formed of imperfectly calcified parts of the enamel. Miller,[22] Schwarz[31] and Schöttl[19] (in part) regarded them as cracks, as have others. Kantarowicz,[2] Hauser,[23] Gräff,[24] Akamatsu[25] and Kato[10] have, as for the tufts, shown that at least many of the lamellae having their origin in poorly calcified weak places in the enamel form the sites of cracks during grinding. In this regard, the observation of Turner[32] that many lamellae run diagonally across many prisms, and Miller's[22] observation that they correspond in position to previously plotted cracks are significant. Here, again, as for the tufts, the balance of opinion is strongly in favor of imperfectly or incompletely calcified parts of the enamel as the explanation of these structures. As such, and because of their variable distribution, they are probably not to be regarded as normal pathways through the enamel.

4. *Interprismatic Substance and "Prism-Sheaths."*—Concerning these subjects there is but little unanimity of opinion. Passing by the radical, and as yet

23. Hauser: Zur Frage der Entstehung der Lamellen und Büschel des Zahnschmelzes, Inaug.-Diss., Freiburg, 1921.

24. Gräff, S.: Zur Frage der Entstehung der Lamellen und Büschel des Zahnschmelzes, Verhandl. d. deutschen pathol. Gesellsch., 1922.

25. Akamatsu, K.: Nochmals zur traumatischen Entstehung der sog. Lamellen und Büschel des Zahnschmelzes, Vierteljahrsschr. f. Zahnheilk., 44:551-567, 1928.

26. Gottlieb, Bernhard: Aetiologie und Prophylaxe der Zahnkaries, Ztschr. f. Stomatol., 19:129-152, 1921.

27. Orbán, Bálint: Schmelz-und Zahnoberhäutchen. Schmelzlamellen und Büschel, Ztschr. f. Stomatol., 24:1-32, 1926.

28. Kronfeld, Rudolf: Einige histologische Befunde an Schafzähnen, Schweiz. Monatschr. f. Zahnheilk., 36:392-397, 1927.

29. Footnote 15, second reference.

30. Meyer, William: Strittige Fragen in der Histologie des Zahnschmelzes, Vierteljahrschr. f. Zahnheilk., 41:305-394, 1925.

31. Schwarz, A.: Untersuchungen über die Verbreitung, Ursache und Bedeutung der Schmelzsprünge beim Menschen und einigen Säugetieren, Deutsch. Monatschr. f. Zahnheilk., 38:97-142, 1920.

32. Turner, J. G.: Finish of Enamel, Brit. Dent. J., 49:8-16 (Jan. 2) 1928.

unsupported, views of Loher,[33] Kato[10] and Allen,[34] we find Walkhoff[35] and Kantarowicz[2] denying the presence of an interprismatic substance, but receiving little support from other investigators. Von Ebner,[36] Meyer,[30] Chase[37] and others recognize a calcified interprismatic substance differing in composition from the prisms. Many, including Bödecker,[29] Malleson,[38] Orbán[16] and Schöttl,[19] recognize a calcified interprismatic substance and an organic prism sheath investing each prism. Cape and Kitchen,[39] alone as far as I am aware, refer to a calcified prism sheath. Adloff,[40] Nishimura,[41] Vainicher[42] and many others regard the interprismatic substance as permeable to fluids, serving for nutrition and calcification of the enamel after eruption. It seems to me that much of the difference of opinion on these matters is due to the examination, by methods of staining or decalcification, of enamel in different formative stages. In the light of a series of specimens of decalcified human enamel of different known ages, now being collected and studied in this laboratory, Smreker's[43] conclusion that the prism sheath is a transitory affair, disappearing with advance of calcification with age (dogs), is by far the best explanation of the true condition of the minute structure of the enamel. Such an explanation reconciles many of the diverse opinions previously expressed, and is, I believe, the correct interpretation. Such a view conceives a structure which leaves permeable pathways by way of the slowly calcifying interprismatic substance. This remains uncalcified longest next the prisms, where it forms the structure so often identified as the prism sheath. Calcification normally completed, no further permeability to stains exists, as Smreker showed.

5. *Enamel Tubules.*—Enamel tubules, normal in enamel of marsupials and some

33. Loher, R.: Beitrag zum gröberen und feineren (submikroskopischen) Bau des Zahnschmelzes und der Dentinfortsätze von Myotis myotis. Zahnstudie I., Zeitschr. f. Zellforsch. u. mikr. Anat., 10:1-37, 1929.

34. Allen, C. E.: New View of Microscopic Anatomy of Human Dental Enamel, Australian J. Dent., 34:3-58 (Jan.) 1930.

35. Footnote 7; Walkhoff, O.: Die vermeintliche Kittsubstanz des Schmelzes, Anat. Anz., 23:199-210, 1903; Ergebnisse neuerer Arbeiten über die Schmelzstruktur, Deutsch. Monatschr. f. Zahnheilk., 22:161-166, 1904; Die Schmelzstruktur in ihrer Bedeutung für die Zahnkaries, ibid., 31:574-577, 1913; Biologische Studien über das Wesen der Zahnkaries, Deutsch. Zahnheilk., No. 42, 1919; Ueber das vermeintliche Leben im Zahnschmelz durchgebrochener Zähne, Ztschr. f. Stomatol., 23:93-110, 1925.

36. V. Ebner, V.: Histologie der Zähne mit Einschluss der Histogenese; in Scheff: Handbuch der Zahnheilkunde, 1:325-399, 1922.

37. Chase, S. W.: Enamel Prisms and Interprismatic Substance, Anat. Rec., 36:239-258 (Sept.) 1927.

38. Malleson, H. C.: Preliminary Note on Structure of Human Enamel as Revealed in Decalcified Sections, Brit. Dent. J., 45:601-609 (May 15) 1924.

39. Cape, A. T., and Kitchen, P. C.: Histologic Phenomena of Tooth Tissues, as Observed Under Polarized Light, with Note on Roentgen-Ray Spectra of Enamel and Dentin, J. A. D. A., 17:193-227 (Feb.) 1930. Brit. Dent. J., 51:101-104, 1930.

40. Adloff, P.: Zur Frage der Kittsubstanz der Schmelzprismen, Deutsch. Monatsch. f. Zahnheilk., 32:454-461, 1914.

41. Nishimura, T.: Histologische Untersuchungen über die Aufgänge der Zahnkaries, speziell der Karies des Schmelzes, Schweiz. Monatschr. f. Zahnheilk., Vol. 36, 1926.

42. Vainicher, G. E.: Lo smalto dei denti, La Stomatol., 27-353-387, 1929.

43. Smreker, E.: Histologische Untersuchungen über den Bau des Schmelzes der Hundezähne, Ztschr. f. Stomatol., 28:1030-1038, 1930.

rodents, are claimed by Caush,[9] Beust,[44] Williams[45] and Kato[10] to be present throughout human enamel as well. As far as I can determine by study of the papers cited above, no one of these investigators has demonstrated structures like those in marsupial enamel. All of the staining phenomena on which they rely for their identification of enamel tubules are far more logically ascribable to the staining of imperfectly calcified regions of the interprismatic substance, or perhaps to spaces arising through shrinkage on drying. In none of the scores of preparations of decalcified or semidecalcified human enamel made by me have any tubular spaces, other than the relatively few spaces due to encroaching dentinal tubules and enamel spindles, been found on close search for them. As in 1927,[37] I can still say that I have yet to see them in human enamel.

6. *Other Possible Pathways.*—Weidenreich,[14] Imbert[46] and particularly Retterer[47] regard the enamel as modified distal parts of the dentin, and, as such, in connection with the rest of the body and its metabolism. This view has but little to recommend it in the face of all that is known regarding amelogenesis, and appears so far beyond the realm of probability that it can be dismissed without further discussion here.

The striae of Retzius have been mentioned by several investigators as possible paths of transfer of fluid, but considering the almost universal interpretation of these structures as evidences of less or greater degrees of disturbance of calcium metabolism during amelogenesis, they must be classed outside the realm of strictly normal parts of the enamel, in spite of their frequent incidence.

To summarize the possible pathways of fluid penetration of the enamel: we find the enamel spindles certainly due to inclusion of the ends of odontoblastic processes in the deeper layers of the enamel, and the enamel tufts, lamellae and Retzius' striae regions of faulty or incomplete calcification of prisms or interprismatic substance. All of these structures are of limited, inconstant and variable distribution, hence scarcely to be regarded as normal pathways for passage of fluids into the enamel. The enamel tubules are probably either nonexistent in human enamel or represented by imperfectly calcified regions like those of the enamel tufts. The prism sheaths, if we accept the view of Smreker, are probably normal uncalcified portions of the interprismatic substance. Until their calcification has been completed, they constitute pathways for conveyance of fluids from dentinal tubules into the enamel. When their calcification has been completed, they are no longer permeable.

The more direct method of investigating possible metabolic activity has included chiefly the determination of the permeability of the enamel to various substances. The many different methods

44. Beust, T. B.: Are Capillaries of Enamel Capable of Sustaining Metabolism? Dent. Cosmos, 56:201-202 (Feb.) 1914.

45. Williams, J. L.: Disputed Points and Unsolved Problems in Normal and Pathological Study of Enamel, J. Dent. Res., 5:27-116 (Sept.) 1923.

46. Imbert, A.: L'émail humain est-il vivant ou mort? Semaine Dent. 8:847, 1926.

47. Retterer, E.: De la dent; origine et structure de la dentine et de l'émail, L'Odontol. 57:475-489, 1919; C'est l'hyaloplasma des odontoblastes, et non leur chondrome, qui édifie la portion dure de la dentine et de l'émail, Compt. rend., Soc. Biol., 83:1617-1619, 1920; De l'émail des incisives des rongeurs, Rev. Stomatol., 28:65-77, 1926.

of attack that have been employed, are discussed below, as follows:

1. *Permeability to Water and Solutions.*—The experiments of Feiler,[48] Bunting and Rickert,[49] Adrion,[50] Wassiljew and Manjewitsch,[51] Lukomsky and Rywkina,[52] Lukomsky,[53] Klein and Amberson,[54] Klein,[55] Gies and collaborators,[56] and Begelmann[57] safely demonstrate the permeability of the apparently intact enamel to water and some solutions. McFall[58] failed to get osmotic passage through human enamel, the flow of liquid being opposed to the induced osmotic force. The claims of Bauchwitz[59] and Bauchwitz and Heimann[60] that not only crystalloids and colloids, but even bacteria and their toxins can diffuse through the intact enamel are adequately answered by Feibusch,[61] who showed that Bauchwitz' conclusions were based on imperfectly sealed preparations. When, instead of the cement used by Bauchwitz, Feibusch used a rubber tube as a seal, he found that neither crystalloids, colloids nor bacteria could pass through intact enamel, though crystalloids could pass by way of cracks. This last observation is of interest in connection with the claims of Wassiljew and Manjewitsch, Lukomsky and Rywkina and Lukomsky that the enamel of dead teeth is more permeable than that of living teeth, which they interpret as proof

48. Feiler: Beiträge zum Stoffwechsel der Zähne, Deutsch. Monatschr. f. Zahnheilk., 31: 748-754 (Plate 18), 1913.

49. Bunting, R. W., and Rickert, U. G.: Tooth, a Permeable Membrane, J. N. D. A., 5:519-526 (May) 1918.

50. Adrion, W.: Experimentelle Untersuchungen über Diffusionsvorgänge in den harten Zahnsubstanzen, Deutsch. Monatschr. f. Zahnheilk., 39:658-663, 1921.

51. Wassiljew, G. A., and Manjewitsch, N. I.: Zu den Lebenseigenschaften des Zahnschmelzes und der anderen Zahngewebes. II. Mitteilung: Die Permeabilität der Zahngewebe für Chlor, Deutsch. Monatschr. f. Zahnheilk., 47:1165-1170, 1929.

52. Lukomsky, J. H., and Rywkina, D. E.: Zu den Lebenseigenschaften des Zahnschmelzes und der anderen Zahngewebe. I. Mitteilung: Die Permeabilität des Zahngewebes für Calcium, Deutsch. Monatschr. f. Zahnheilk., 47:1113-1122, 1929.

53. Lukomsky, J. H.: Zu den Lebenseigenschaften des Zahnschmelzes und der anderen Zahngewebe. IV. Mitteilung: Schlussbemerkungen, Deutsch. Monatschr. f. Zahnheilk., 48: 31-36, 1930.

54. Klein, Henry, and Amberson, W. R.: Physico-Chemical Study of Structure of Dental Enamel, J. Dent. Res., 9:667-681 (Oct.) 1929.

55. Klein, Henry: Physico-Chemical Studies on Structure of Dental Enamel. II. Quantitative Method for Determining Relative Differences in Permeability of Teeth, J. Dent. Res., 10:447-450 (Aug.) 1930; Physico-Chemical Studies on Structure of Dental Enamel. III. Method for Determining Rate at Which a Salt May Penetrate Enamel, ibid., 10:727-731 (Dec.) 1930.

56. Gies, W. J., and collaborators: Studies of Dental Caries, with Special Reference to Internal Secretions in Relation to Development and Condition of Dental Enamel, J. Dent. Res., 10:215-218 (April) 1930.

57. Begelmann, I.: Die elektrische Leitfähigkeit als Methode zur Bestimmung der Permeabilität des Schmelzes, Ztschr. f. Stomatol., 28:1058-1070, 1930.

58. McFall, T. A.: Some Properties of Enamel, Reconsidered, J. Dent. Res. 10:377 (June) 1930.

59. Bauchwitz: Ueber Diffusionsvorgänge in den harten Zahnsubstanzen, Zahnärztl. Rund., 21, 24, 1921.

60. Bauchwitz and Heiman: Weitere Untersuchungen über das Durchlässigkeitsvermögen der harten Zahnsubstanzen, Zahnärztl. Rund., 35:21-27, 1926.

61. Feibusch, L.: Zur Frage der sogenannten "Diffusionsvorgänge im harten Zahngewebe," Deutsch. Monatschr. f. Zahnheilk., 40:631-639, 1922.

of the vitality of enamel. This contention is not conclusive because the greater permeability is far more plausibly explained on a basis of the greater number of cracks so often observed in nonvital teeth. Contrary evidence is presented also by Keerl (1900) (cited by Urbantschitsch[62]), who could drive a 20 per cent cocain solution stained with methylene blue through the crown to the middle of the dentin by cataphoresis in living teeth, but obtained no penetration in pulpless teeth.

On considering the evidence as a whole, it is certain that enamel is permeable to some solutions, but there exists a serious doubt that such permeability is not largely dependent on imperfections or cracks.

2. *Permeability to Endogenous or Adventitious Stains.*—Urbantschitsch[63] reviewed the work of Hoffmann,[64] Türkheim,[65] Fraenkl[66] and others, and found that the evidence submitted concerning endogenous staining of teeth is almost entirely negative as concerns the enamel. Change in color of teeth after inflammation or death of the pulp, in icterus, with madder-feeding and with hematoporphyrin injections, is ascribable to dentin of altered color showing through the semitransparent enamel. Wittman[67] concurs in this opinion.

In mottled enamel, Black and McKay[68] have adequately demonstrated that the pigmentary deposits lie in spaces left by partial dissolution of the interprismatic substance.

Howe[69] demonstrated lead in the enamel tufts of teeth from cases of lead poisoning and from teeth of guinea-pigs fed with lead acetate. DeVecchis[70] found grayish or brownish flecks in the enamel of syphilitics under treatment with mercury salts. He localized the deposits responsible for the flecks in spaces in the enamel and found that the flecks disappeared about a year after discontinuance of medication. Neither of these observations signifies other than chemical deposition, in both instances in regions of imperfection.

Beust and Mieki[71] and Appelbaum,[72] among others, have described staining of enamel, in the neighborhood of amalgam fillings, which they have considered evidence of reactive processes in nutrient channels through the enamel. Their argument loses its force in view of Walk-

62. Urbantschitsch, E. H.: Ursachen und Bahnen der endogenen Zahnverfärbungen. II. Die Bahnen, Ztschr. f. Stomatol., 25:19-34; 789-800; 1054-1072, 1927.

63. Urbantschitsch, E. H.: Ursachen und Bahnen der endogenen Zahnverfärbungen. 1. Die Ursachen, Ztschr. f. Stomatol., 24:1050-1075, 1926.

64. Hoffmann, H.: Pathologie und Therapie der Verfärbung menschlicher Zähne, Inaug. Diss. (cited by Urbantschitsch, Footnote 62), 1923.

65. Türkheim, H.: Die Ernährung und die physikalische Chemie des Schmelzes, Vierteljahrsschr. f. Zahnheilk., 38:486-499 (Plate 1), 1922; Über die Bedeutung der Schmelzfärbung, Ztschr. f. Stomatol., 20:653-657 (Plate 1), 1922.

66. Fraenkl, E.: Experimentelles über Hämatoporphyrie, Arch. f. pathol. Anat. u. Physiol., 248:125-136, 1924.

67. Wittman, Ronald: Discoloured Devitalized Teeth. Cause and Treatment. Australian J. Dent., 34:107-109 (March) 1930.

68. Black, G. V., and McKay, F. S.: Mottled Teeth, Dent. Cosmos, 58:129-156 (Feb.) 1916.

69. Howe, P. R.: New Research on Dental Caries, Dent. Cosmos, 68:1021-1033 (Nov.) 1926.

70. DeVecchis, B.: La permeabilitá dello smalto, La Stomatol., 25:73-106, 1927; La vie umorali dello smalto, ibid., 27:453-455, 1929.

71. Beust, T. B.: and Mieki: Die Färbbarkeit der mikroskopischen Schmelzgefässe, Arch. f. Zahnheilk., Nos. 1, 2, 4, 1912.

72. Appelbaum, Edmund: Lymph Channels in Dentine and Enamel Stained by Amalgam, J. Dent. Res., 9:487-502 (Aug.) 1929.

hoff's[73] criticism that the staining occurs just as well in pulpless teeth as in teeth with vital pulps.

3. *Penetration of the Enamel by Dyes.*—Since Rudas[74] stained the dried spaces in the enamel of fossil teeth with fuchsin, and Caush[9] obtained penetration of fuchsin into fresh teeth, Smreker,[75] v. Ebner[76] and a host of others have succeeded in staining various uncalcified or deficiently calcified parts of the enamel by various stains and by different methods. The most commonly used stains have been fuchsin, safranin, silver nitrate, ammoniacal silver solution and methylene blue. The methods have included simple immersion in the dye and the use of pressure, partial vacuum and cataphoresis. The results have been very diverse as far as concerns the amount and uniformity of the stain, but have been for the most part in agreement concerning the parts of the enamel stained. Beust and Mieki,[71] by use of pressure, showed passage of stain from the pulp chamber into the uncalcified elements of the enamel, even through its entire thickness. On the other hand, Pickerill,[77] Kantarowicz,[2] Rygge,[78] Bunting and Rickert,[49] Türkheim,[79] Skillen[80] and Dierks[81] were unable to stain the enamel from its dentinal side, claiming that the dentino-enamel junction is impermeable, though they admitted penetration from the external surface. Urbantschitsch[62] obtained staining in isolated places from the dentinal surface, but a much greater penetration from the outer surface. A host of other investigators have stained the tufts, lamellae, spindles, prism sheaths and Retzius' striae; in other words, the imperfectly or incompletely calcified parts of the enamel, from either surface (Mummery,[82] Williams,[45] Faber,[83] Fish[84] and others). Von Ebner,[76] Morgenstern,[85] Smreker[43] and others have shown that the permeability decreases with age, Smreker considering that fully formed enamel is impermeable. This latter view, Leigh,[86] Hopewell-

73. Footnote 35, fifth reference.

74. Rudas, G.: Beiträge zur Histologie des Zahnschmelzes, Zahnärztl. Rund. 12, 1903.

75. Smreker, E.: Ueber die Darstellung der Kittsubstanz des Schmelzes menschlicher Zähne, Anat. Anz., 22:467-476, 1903; Ueber die Form des Schmelzprismen menschlicher Zähne und die Kittsubstanz des Schmelzes, Arch. f. mikr. Anat., 66:312-331, 1905.

76. V. Ebner, V.: Ueber die histologischen Veränderungen des Zahnschmelzes während der Erhärtung insbesondere beim Menschen, Arch. f. mikr. Anat., 67:18-81, 1906.

77. Pickerill, H. P.: Structure of Enamel, Dent. Cosmos, 55:969-988 (Oct.) 1913.

78. Rygge, J.: Formation and Structure of Enamel, Norsk. Tandläg., No. 7, 1916; abstr. Dent. Cosmos, 59:558-559 (May) 1917.

79. Footnote 65; Türkheim, H.: Ueber den sogenannten Schmelzstoffwechsel. Bemerkungen zu den Ausführungen der Herren Faber und Walkhoff in Nr. 10, 1924, und Nr. 2, 1925, dieser Zeitschrift, Ztschr. f. Stomatol., 23:642-646, 1925.

80. Skillen, W. G.: Permeability of Enamel in Relation to Stains, J. A. D. A., 11:402-406 (May) 1924.

81. Dierks, K.: Experimentelle Beiträge zur sogenannten Vitalität des Schmelzes. Ueber die Färbbarkeit des Tierzahnschmelzes, Zahnärztl. Rund., 37:905-913; 945-952; 989-994, 1928.

82. Mummery, J. H.: Microscopic Anatomy of Teeth, London, 1919.

83. Footnote 20, first, second and third references.

84. Fish, E. W.: Circulation of Lymph in Dentin and Enamel, J. A. D. A., 14:804-817 (May) 1927.

85. Morgenstern, M.: Untersuchungen über die anatomischen Grundlagen für die Stoffwechsel-und Sensibilitätsvorgänge in den harten Zahnsubstanzen, Deutsch. Monatschr. f. Zahnheilk., 27:713-727, 1909.

86. Leigh, R. W.: Staining of Human Enamel in Bulk, J. A. D. A., 12:1415-1434 (Dec.) 1925.

Smith[87] and others have already expressed. Leigh sums up the phenomena very ably by saying that normal enamel is unstainable by anilin dyes. Pits, fissures, faults, fracture lines, bruised areas, carious enamel, mottled enamel and incompletely calcified enamel permit penetration from the outside. Enamel spindles, dentinal tubules, granular rods, hypoplastic regions, fracture lines and carious spots permit penetration from the dentin outward.

The fact that reports on the penetration of stains into the enamel are so exceedingly variable, even for the behavior of the same dyes under similar conditions, must point to the conclusion that the enamel itself is variable, a condition we are already aware of from study of the several expressions of this variability presented by spindles, tufts, lamellae, Retzius' striae, granular rods and dissolved or incompletely calcified interprismatic substance. Certainly there is markedly greater permeability of young teeth than of old, and just as certainly, there is greater permeability of faultily calcified teeth than of normally calcified. Reduced to essentials, we must admit that the chief pathways of permeability in the enamel are the regions in which calcification is incomplete, either because of age or because of disturbance of calcium-metabolism during histogenesis of the enamel.

4. *Intravital Staining of Enamel.*—Because Ganzer[88] found the intravital stain imparted to the first deposited secretions of the ameloblasts transitory, he regarded this substance as vital. After its calcification, because it did not stain, he believed that it becomes dead, or rather no longer remains in metabolic relation to the rest of the organism. Gottlieb's[89] experiments with madder-feeding and injection of alizarin sodium monosulphonate, in which the organic parts of the enamel were stained, convinced him that there is a flow of fluid from dentin into enamel. Blotevogel[90] found trypan blue stain in teeth of young mice lost after two weeks and concluded that enamel is stainable only as long as it is in connection with the enamel organ. Bödecker and Gies[91] conclude that since, after vital staining with trypan blue, the dye is removed from all tissues except enamel, there is very slight, if not wholly negative, probability of nutrition of the enamel. Urbantschitsch[62] found iron saccharid, demonstrable by Prussian blue reaction in teeth of mice after injection of the substance intravitally, was no longer demonstrable after three months.

The experimental results of these investigators and others really prove nothing concerning vitality, but merely strengthen our evidence that the uncalcified matrix of the enamel is stainable.

87. Hopewell-Smith, Arthur: Human Enamel: Facts, Explanations and Applications, Dent. Cosmos, 68:639-668 (July) 1926.

88. Ganzer, H.: Die physiologische Injektion zum Studium der Histogenese des Zahnschmelzes, Anat. Anz., 28:436-442, 1906.

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91. Bödecker, C. F., and Gies, W. J.: Histochemical Proof of Presence of Protein Matter in Dental Enamel, Proc., Soc. Exper. Biol. & Med., 22:175-176, 1924.

PHYSICOCHEMICAL CHANGES IN THE ENAMEL AFTER ERUPTION

There is apparently no doubt that enamel hardens with age. Among the many writers who have expressed opinions as to method, Miller,[22] Williams[45] and Türkheim[92] ascribe such a change to purely physicochemical processes, while Baumgartner[93] and Andresen[94] invoke the aid of metabolic processes.

Increased brittleness with age is claimed by Fleischmann,[95] Radoševič[96] and Vainicher.[42] Bödecker[29] and Hopewell-Smith[87] believed this brittleness due to death of the pulp, the latter stating that it is due to drying or removal of the moisture of the underlying dentin.

Hoppe-Seyler,[1] Ebner[76] and Cape and Kitchen[39] have shown that the positive birefringence of primary enamel changes later to negative birefringence.

Fischer[11] described transparent enamel preceding carious zones, and Pickerill[77] and Mummery[97] also mention the possibility of this alteration in enamel. Kantarowicz[2] believed Fischer's conception erroneous, and the idea has not been well received.

92. Footnote 79, second reference.

93. Baumgartner, E.: Ueber das Wesen der Zahnkaries mit besonderer Berücksichtigung der Histologie des gesunden und kariösen Zahnschmelzes, Deutsch. Monatschr. f. Zahnheilk., 29:321-371, 1911.

94. Andresen, V.: Ueber Mineralisation und Remineralisation des Zahnschmelzes, Deutsch. Monatschr. f. Zahnheilk., 39:97-122, 1921.

95. Fleischmann, L.: Histologie und Histogenese, Ergebn. d. ges. Zahnheilk., 1:1-28, 1910.

96. Radoševič, E.: Einige osmotische Untersuchungen an den Zähnen, Deutsch. Monatschr. f. Zahnheilk., 40:464-473, 1922.

97. Mummery, J. H.: Translucent Zones in Enamel, Brit. Dent. J., 47:473-482 (May 1) 1926.

POSSIBILITY OF REPAIR (RECALCIFICATION)

Though the recalcification of partially decalcified enamel had been mentioned as a possibility before, the work of Head[98] really precipitated the modern arguments for and against such a process. Head, on a basis of experimental evidence, claimed that enamel, partly decalcified, could be restored to normal hardness and smoothness by immersion for weeks in saliva at body temperature. Pickerill,[77] Bunting and Rickert,[49] Andresen,[99] Cleaveland,[100] and Wilson,[101] among others, have supported this view. Türkheim,[65] Kantarowicz,[102] Turner[32] and Williams[103] have expressed opinions against the possibility. Weber[104] has performed the first well-controlled experimental test of this question. He found that previously partly decalcified teeth immersed in salivas of known calcium-content showed, not the gain in calcium to be expected if Head's

98. Head, J.: Enamel Softening and Rehardening as Factor in Erosion, Dent. Cosmos, 52:46-48 (Jan.) 1910; Saliva and Hardening and Softening of Tooth Enamel, Dent. Rec., 33:590-592, 1913.

99. Footnote 94. Andresen, V.: Mineralisation zur Behandlung der Caries incipiens, Deutsch. Monatschr. f. Zahnheilk., 40:707-711, 1922.

100. Cleaveland, H. H.: Is There Metabolism in Enamel? Dent. Digest, 34:721-722 (Oct.) 1928.

101. Wilson, L. A.: Is Artificial Calcification and Recalcification of Dental Enamel Possible? Dent. Digest, 34:689-702 (Oct.) 1928; Further Evidence on Subject of Recalcification of Enamel, Dent. Digest, 35:6-13 (Jan.) 1929.

102. Kantarowicz, Alfred: Klin. Zahnheilk., 1924.

103. Williams, J. L.: Dr. Wilson and Reconstruction of Enamel, Brit. J. Dent. Sc., 74:18-24, 1929.

104. Weber, R.: Experimentelle Untersuchungen über die Frage der Remineralisation des Zahnschmelzes durch den Speichel, Ztschr. f. Stomatol., 27:912-926, 1929.

contention were correct, but a further loss of calcium. This is very strong evidence against the possibility of recalcification by the action of saliva. Further evidence against the recalcification theory is afforded by Bödecker's[105] trial of Andresen's method of hardening poorly calcified teeth by the use of a powder composed of various calcium, magnesium and sodium salts. Bödecker found he could effect the disappearance of chalky spots in enamel after long continued treatment, but that the spot reappeared shortly after discontinuance of the treatment. Ehrensperger[106] found similarly only a transitory effect on decalcified enamel by immersion in strong salt mixtures.

POSSIBILITY OF INCREASE IN SIZE OF THE ENAMEL AFTER ERUPTION

Donaldson and French [107] on measurements of molar teeth in series of young and old albino rat skulls, found an apparent marked increase in diameter of the crowns. Beust (1929) reported similar increase in size of pigs' molars. Donaldson's work has recently been checked and apparently refuted by Wood and Wood,[108] who have made casts and accurate measurements of the molars of the same seven living rats over a long period without finding any increase in size.

EVIDENCE OF CHANGE IN CHEMICAL COMPOSITION

Change in chemical composition after eruption has frequently been inferred. The literature contains many statements to the effect that the organic content is higher in youth and in imperfect calcification. These claims have not been supported by chemical analyses, Sprawson and Bury[109] stating that the organic content of enamel is independent of age or dentition.

A wide-spread belief exists that there is a calcium drain during pregnancy, but Fish[110] and Karlström and Gies[111] have found a normal calcium content in teeth during pregnancy. The evidence for greater incidence of caries during pregnancy is mostly derived from uncontrolled or insufficiently controlled series of observations. For example, Gerson[112] examined fifty pregnant women and compared the progress of caries in their teeth with that in the teeth of fifty nulliparous women. He found the ratio of progress of caries in the pregnant group was to that in the nulliparous group as 89:43, but Gerson made no recorded attempt to balance his groups taking age into account. When this is done, as Kantarowicz[2] shows, nulliparae have as high an incidence of caries as have

105. Bödecker, C. F.: Remineralization of White Spots in Dental Enamel, Internat. J. Orthodon., 16:1146-1149 (Nov.) 1930.

106. Ehrensperger, M.: Ueber künstlich erzeugte Caries incipiens des Schmelzes und über die Remineralisationsmöglichkeit der natürlich entstandenen Caries incipiens, Schweiz. Monatschr. f. Zahnheilk., 40:113-160 (March) 1930.

107. Donaldson, H. H., and French, H. E.: Growth in Diameters of Molar Teeth of Albino Rat, After Eruption, Anat. Rec., 34: 277-299 (Feb. 25) 1927.

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109. Sprawson, E., and Bury, F. W.: Chemical Evidence of Organic Content of Human Enamel, Proc. Roy. Soc. (ser. B), 102:419-426, 1928.

110. Fish, E. W.: Circulation of Lymph in Dentinal Tubules with Observations on Metabolism of Dentine, Proc. Roy. Soc. Med. (Sec. Odontol.), 19:59-72, 1926.

111. Karlström, S., and Gies, W. J.: Svensk. Tandläk. 20:176, 1927.

112. Gerson, F.: Karies und Schwangerschaft, Zahnärztl. Rund. 16, 1921.

multiparae of equal age. Similarly, Ziskin's[113] report based on examination of the teeth of an adequately controlled series of 804 women states that pregnancy, of itself, cannot be assigned as a cause of caries.

If we weigh the evidence presented, we find only a few items which could possibly be interpreted in favor of the presence of metabolic processes in the enamel, and we find that all of these may more easily and more logically be explained on physicochemical than on vital grounds.

It has been established that the enamel is permeable to water and molecular solutions. Obviously, this alone does not signify metabolism, since parchment, clay and collodion membranes, certainly not vital, exhibit the same phenomena. Even glass, which is not at all organic, is permeable to hydrogen ions and, under certain conditions, to sodium ions.

It has been established that there are organic pathways in the enamel. This means but little as far as metabolism is concerned in view of the demonstration by Rosebury and Gies,[114] Chase,[115] Rosebury[116] and others that this substance is of a keratinous nature and that, furthermore, no soluble proteins are demonstrable in the enamel.

It has been established that a hardening process occurs in the enamel after separation from its parent ameloblasts. This process is far more easily explained on physicochemical grounds than on a basis of metabolic activity. One has only to mention the retention of microscopic structural detail in those fossils which have been formed by replacement of their organic matter by strictly inorganic material, such as calcite, to show how such hardening could be accomplished by simple infiltration and replacement.

SUMMARY AND CONCLUSIONS

If we summarize the findings of our comparison of observational and experimental evidence having a possible bearing on the question of vitality of the enamel, we find a balance of evidence in favor of the following items:

1. The evidence obtained from endogenous or adventitious staining gives us no clue other than the observations showing depositions of matter in spaces or uncalcified imperfections.

2. The majority of evidence is in favor of the capacity of the intact enamel to behave as a permeable membrane, but evidence to the contrary has been advanced.

3. Substances in solution can penetrate youthful enamel or imperfectly formed enamel by way of uncalcified tracts which are not uniformly distributed and which are not present or are rare in well formed, adult enamel.

4. The penetration of substances in solution is aided by cataphoresis, pressure or vacuum, but proceeds by the same pathways and under the same conditions of age and of normal or deficient formation.

5. The preponderance of evidence obtained from vital staining of the enamel is to the effect that enamel just deposited is stainable intravitally, but loses this

113. Ziskin, D. E.: Incidence of Dental Caries in Pregnant Women, Am. J. Obstet. & Gynec, 12:710-719 (Nov.) 1926.

114. Rosebury, Theodor, and Gies, W. J.: Simplified Procedure for Separation and Identification of Protein in Dental Enamel, J. Dent. Res., 9:299-301 (June) 1929.

115. Chase, S. W.: Additional Evidence of Keratinous Nature of Enamel Matrix, J. Dent. Res., 9:288 (June) 1929.

116. Rosebury, Theodor: Biochemical Study of Protein in Dental Enamel, J. Dent. Res., 10:187-213 (April) 1930.

stainability; hence, its permeability, after calcification.

6. All of the pathways of transfer of fluids demonstrated by the various staining experiments, i. e., enamel spindles, enamel lamellae, enamel tufts, interprismatic substance and so-called prism sheaths, enamel tubules and Retzius' striae, are portions of the enamel subject to delayed or deficient calcification.

7. The enamel hardens after eruption, perhaps through the agency of conductive pathways in the interprismatic substance, which remains uncalcified longest next to the prisms.

8. The birefringence of enamel changes during the early period following its deposition.

9. The permeability of enamel decreases with age, perhaps betokening additional calcification.

10. Changes in chemical composition of enamel after its formation have not been adequately demonstrated.

11. The case for repair or recalcification of enamel by the saliva is not proved. The preponderance of evidence is against such a process.

12. Claims for increase in size of the enamel after eruption have been refuted by stronger evidence against such growth, but the question is still open.

13. The preponderance of evidence is against a calcium-loss from the enamel during pregnancy.

14. Respiration in the enamel has not been demonstrated.

15. In order to prove vitality for the enamel, it would be necessary to demonstrate at least some of the properties possessed by all living protoplasm. These fundamental properties are: metabolism, growth, repair, reproduction, irritability, contractility, respiration. None of these properties has been adequately demonstrated.

16. The enamel is neither metabolic nor vital in any sense of these terms.

17. The enamel is a lifeless, inert, mostly inorganic substance, subject to influence by only physical and chemical processes which are chiefly of a destructive nature, but may contribute minute amounts of inorganic increments.

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A BURNISHING VS. A COMPRESSION TECHNIC IN THE CONDENSATION OF AMALGAM

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THE successful management of quickly crystallizing modern high-grade dental alloys, approved or unapproved, as applied to the elimination of the most common cause of leaks, structural defects, is entirely different from the technic required in the use of the slowly crystallizing low-silver alloys; and their successful use is entirely dependent on an exact knowledge of their physical peculiarities and the application of an array of small manipulative and operative details. The neglect of any one of these details will show unfavorable results when accurately measured in our scientific laboratory tests, if not to the naked eye.

The air cannot be eliminated from a snowball by *en masse* hand compression. The early developing interlocking crystallization becomes sufficiently resistant to ordinary compression that the ball remains white, because of the air voids contained. We can easily compress a few crystals of snow at one time, but not a mass, or large group.

A body of amalgam packed or compressed under a plugger in like manner develops the same condition in modern high-grade dental alloys. Maximum density of high grade amalgams may be attained by a condensing technic applied by hand on the high point of a burnisher on a few grains of amalgam at one time, but not when applied on a mass under a 2 to 3 mm. plugger. This is possibly the explanation of the comparative perfection attained by a properly applied burnishing technic, such as I here present and demonstrate. It is a condensing technic that assures practical uniformity throughout the filling and is applied on a few grains at a time, instead of on a mass of interlocking crystals that cannot be compressed by hand into maximum density.

Our present accepted amalgam packing technic provides abundantly for hardness and resistance to flow and crushing stress, but has proved undependable in the attainment of nonleaking adaptation, when applied under mouth operating conditions. Recognition of these facts has led to the development of the following changes in my amalgam procedure, every detail of which has been proved by average successful results in more than 500 exact laboratory tests, made under the closest possible approach to mouth operating conditions.

The following proved outline of the most practical and successful manipulative management for the development of the essential physical qualities of nonleaking adaptability, hardness and resistance to flow and crushing stress is presented with the assurance that my demonstrations will prove their operative simplicity and general dependability.

The generally neglected but equally important dental health considerations dependent on a correct restoration of interproximal and occlusal form and finish are not overlooked. This phase of our amalgam work is already taught, and as

I feel that it is a subject in itself, I shall omit it at this time.

A century of public service, much of which has often been done under the most adverse conditions, demonstrates that amalgam will render better average tooth-saving service than gold in any form, if placed with the same care and skill where indicated because of difficulties of location or extent of decay, or because of the limited financial circumstances of the patient.

The following outline will provide for the development of nonleaking adaptability, resistance to flow and crushing stress and perfect adaptation.

A properly made 66 to 69 per cent silver high-grade dental alloy, medium or quick setting, is a first requirement. The use of the medium setting alloys is very

Fig. 1.—Start and completion of the burnishing stroke used in filling a simple generally rounded cavity. At the center of the cavity *C*, the operator starts with very light burnishing pressure, and in one gradually enlarging stroke, *G*, reaches the surrounding cavity walls, angles and margins; against which he exerts increased burnishing pressure, passing around the walls a few times for extra thoroughness. This burnishing detail is repeated, except that the plasticity is increasingly decreased until it just remains workably dry for the finishing of the filling. As the amalgam becomes solid and securely anchored the burnishing pressure is also increased and the thoroughness with which the work is done. If narrow extensions occur in the cavity wall, it will be found necessary to resort to the use of smaller burnishers in sealing the surrounding cavity walls and its extensions.

wasteful of the operator's time, and their use prohibits a low dental fee except at the expense of the dentist. For this reason, I have learned to use successfully the quick setting amalgams because of their great time-saving possibilities.

Proportions.—Different alloys require different proportions, but the proportions given by the manufacturer may be slightly modified to suit the operator, whether he is quick or slow; but mercury should always be used in liberal excess for mixing.

Mixing.—Modern high-grade dental alloys cannot be successfully mixed in the hand. The alloy and the mercury must be rapidly rubbed in a deep mortar until the mix appears a dull silver white (one

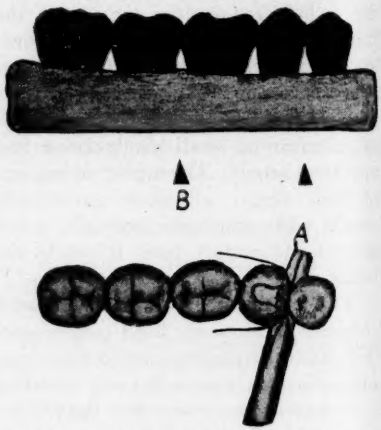

Fig. 2.—Simplest and most practical means for properly and securely holding the matrix, and, at the same time providing to a reasonable degree the desired tooth separation. A double wedge is used. The end, *A*, is shaped for insertion (always from the lingual aspect) and *B*, the gingivoclusal wedge form; a form that materially aids in shaping the interproximal space and at the same time secures close apposition of the matrix along as much as is possible of the gingival length of the buccal and lingual margins. Failure to restore interproximal form is one of the most discouraging and generally neglected essentials in the proper management of amalgam.

or two minutes in the mortar), after which it should be mulled or kneaded in the hand for from one to two minutes (in all, two and one-half to three and one-half minutes in the hand and mortar). At the end of this mixing time, the amalgam should be as plastic as workably possible and consistent with making a strong union or weld. None of the excess mercury used should be expressed after the mixing, and before the placing of the amalgam in the cavity, it should be used in this very plastic state as hereafter described.

PLASTICITY REQUIRED DURING CONDENSATION OF EXTREME IMPORTANCE

The first one or two pieces of amalgam used to cover the floor and line and point angles of the cavity must be as plastic as possible, as it is tamped and burnished to place. That part of the amalgam unused or unkneaded, at the end of this time, will have stiffened somewhat, a condition that requires that it be brought back to its original plasticity before use, to assure adaptability. Each piece to be used should, as separated from the mass, be placed in the palm of the hand and again kneaded (for from three to six seconds) to restore its necessary plasticity before placing it in the cavity. If after this brief kneading, the amalgam is considered too plastic, a little of its excess mercury may be pinched out immediately before using it. If amalgam is placed in the cavity without this brief kneading, it cannot be dependably adapted to the cavity walls and its angles.

The extent of the plasticity of each piece of amalgam to be used may be slightly reduced in an increasing degree as the filling progresses, until, at the finish, it may be as dry as possible to be consistent with strong union and practicable workability.

The kneading of each piece of amalgam to be used, as suggested, will enable many operators who now fail to use successfully the time saving quick setting amalgams and will provide proper plasticity at all times during the condensing period. I consider this detail one of the secrets of the successful use of the quick setting amalgams, a worth while economic procedure, because of its time saving possibilities.

Very plastic amalgam from which we express the excess mercury, immediately after completing the mix (as generally taught and practiced), is caused to crystallize or set sufficiently to impair or destroy its microscopic adaptability. This practice is always a dangerous procedure in the use of high-grade amalgams.

INSTRUMENTS

The new condensing technic requires the use of three special burnishers and one special plugger. These instruments are of special form and size, determined and proved by over three years of average successful experimental test work, accurately measured for leaks under the air test, and also for strength.

Understandingly used, this small number of condensing instruments will be found to meet every building and condensing need in every size and form of cavity that we may be called on to fill.

Notwithstanding the seeming moldability of average plastic amalgam, it will not nonleakingly fill line and point angles, or pockets, unless packed extra plastic, and packed or burnished with instruments that will reach well into their depths. For this reason, all parts of a cavity must be made accessible to the size and form of the condensing instruments available for use.

The successful application of the new burnishing technic is easily within the

ability of the average operator, which is not true of the present taught packing technic.

The instruments and instrumentation I present for dependably making nonleaking fillings with modern high-grade amalgams appear extremely simple, as presented; but it has taken the practical and laboratory test experience of more than thirty years to recognize the cause of our failures and to devise effective and practical corrective measures, the essentials of which are presented in this brief paper.

The detailed burnishing technic for the filling of irregularly round or oval cavities is as follows:

A piece of very plastic amalgam, sufficient to cover well the entire floor of the cavity, is placed and lightly tamped until it settles as a solid plastic layer in contact with the surrounding cavity walls and well into its line and point angles.

We now select a condensing burnisher, about half the size of the cavity diameter, and with light pressure against the floor of the center of the cavity, we burnish in one continuous stroke applied in enlarging circles, as indicated by the fine line *G*, Figure 1, until we reach the surrounding cavity walls, along and against which we burnish with increased force and thoroughness.

Burnishing with proper force and thoroughness against the surrounding cavity walls and angles assures the most nearly perfect nonleaking adaptation where its needs are the greatest.

In burnishing the first piece of very plastic amalgam to place, it may be found that the surrounding cavity walls and its angles are alone covered, which is all that is necessary at this time. The floor will be dependably covered when we add the slightly less plastic second piece of amalgam.

A second piece of very slightly less plastic amalgam is added and burnished in like manner, this process being repeated until the cavity is filled, with an excess well covering its margins.

As before stated, each piece of amalgam added is used somewhat less plastic until, for the finishing pieces, it may be as dry as it is possible to unite or be welded strongly and remain workable with the filling.

The burnishing procedure for proximoclusal fillings is the same in general principle as for the round or oval cavities, except that the difference in angularities of form and floor levels requires the use of burnishers of different diameters, and also the use of the special plugger, to seal dependably the gingival margin and its point angles (at which point most of these fillings develop leaks under the old packing technic).

In the proximoclusal cavity, we start the filling by taking a piece of very plastic amalgam and, with the burnisher, we lightly tamp the amalgam to place and then burnish it from buccal to lingual aspect, generally using the small burnisher, and as we reach the opposite wall, we withdraw the burnisher occlusally along the buccal and along the lingual margin, forcing the amalgam into the line angle at this point with each stroke, after which we use the special plugger, holding it tightly in the buccal or lingual point angles and against the matrix and pack forcibly into the angles and against the gingival margin. We now step from buccal to lingual aspect with this plugger, to seal the gingival margin dependably.

The narrow diameter of this special plugger insures opportunity for the application of a sufficient amount of packing force to seal effectively the gingival margins and its dangerous point angles, and its extra length prevents the operator

from chopping the amalgam as it is stepped from place to place.

This procedure is repeated until the amalgam is built even with the level of the step floor, at which point we fill the remainder of the cavity with the large burnisher, using it by burnishing from buccal to lingual or lingual to buccal aspect on the proximal portion of the filling first, and then in an irregularly circular direction for the step portion of the cavity.

In the use of the large burnisher, it must be noted that an instrument of this size will not reach to the acute angles along the buccal and lingual aspect, at which points we use the small burnisher, working from buccal to lingual aspect immediately against the matrix, and withdrawing it occlusally with each stroke, to seal the buccal and lingual margins dependably. This operation is repeated until we cover well the occlusal cavity margins; which concludes the condensation of the filling.

In the building of the proximoclusal filling, it is important that the operator give attention to the needs of an interproximal contact. As we reach the contact, we exert increased burnishing force against the matrix to cause it to stretch sufficiently to make a well formed contact point that should need no trimming or polishing.

The time saving possibilities of the quick setting amalgams and an accurately and securely applied matrix cannot be fully appreciated until used in daily practice.

Figure 2 illustrates what I have found the simplest and most effective means of placing and securing a matrix. Orangewood sticks are trimmed or filed to the form of a double wedge, slightly wedge-shaped as at *A* to permit its insertion from the lingual aspect, and wedge-shaped as at *B* to take the form of the interproximal space as illustrated in the silhouette.

These wedges are prepared to meet the needs of each case and should be inserted with all force practically possible, to assure security and to gain maximum separation. If these wedges are properly formed, placed and secured, there will be no overlaps of the amalgam gingivally from the contact point, nor will there be any necessity for trimming or further shaping of the contact point, not even polishing, a time saving fact.

Amalgam packed properly against a matrix will be as smooth as the polished surface against which it is packed, and will require no further polishing. For adaptation as nearly perfect as this, it calls for burnishing against the walls rather than the use of the thrust stroke.

As a special warning, no burnishing pressure should be applied against an axial wall. Pressure against a thin yielding wall of elastic dentin will develop a permanent pressure that in its cumulative effect will permanently irritate, if not ultimately destroy, the pulp. If this amalgam pressure is avoided, pulps will be found as tolerant of amalgam filling as when ordinary cements are used. When we avoid the development of this pressure, we find pulps as tolerant of thermal shock as in the use of any other permanent filling material.

This burnishing technic is easily within the ability of the average operator; which is not true of our present packing technic. It requires less time, is more certain and more nearly perfect in results; and it has proved to be the nearest approach, in my hands, to a practical solution of our amalgam problems that has developed since the discovery of the fundamental importance of the use of amalgam in a state of wet plasticity.

RADIODONTIA IN OPERATIVE DENTISTRY*

By HOWARD R. RAPER, D.D.S., F.A.C.D., Albuquerque, N. M.

DIRECTLY or indirectly, radiodontia has had a tremendous influence on all branches of dentistry. Before the development of what we might call the radiodontic era, the popular conception of the extraction of teeth was that it was a very simple operation if the operator were only skilful enough to give the "proper twist." When dentists failed to "get" the tooth promptly, patients blamed them for incompetency. All this has been changed by radiodontia. People realize that the removal of a tooth is a surgical operation which takes skill and may take considerable time.

That radiodontia has already had a great influence on the practice of operative dentistry is perfectly apparent if we stop to consider the treatment of teeth before the radiodontic era and since, but it has taken the development of the interproximal roentgen-ray examination to indicate the extent of the influence radiodontia is yet to have on the practice of operative dentistry. More than a half million interproximal negatives were made last year. Many more will be used this year.

New methods develop not only new possibilities but new problems as well, for new methods and old rules won't mix.

Since a large number of interproximal negatives are being made by the dental profession, it is inevitable that the men who are making these negatives are facing new problems, and to face new problems, of course, is to struggle and to make some mistakes and finally to revise some of the principles of practice. The purpose of this paper, then, is to consider some of these struggles which are leading to a better operative dentistry.

*Read before the Section on Oral Surgery and Radiodontia at the Midwinter Clinic of the Chicago Dental Society, Feb. 4, 1931.

MISTAKES

First of all, let us see whether any mistakes in interpretation are being made. The list of mistakes in interpretation of periapical negatives is all but endless. Fortunately, there seems to be only one important mistake in the interpretation of interproximal negatives for our consideration. That mistake is the misinterpretation of normal cervical radiolucency, misjudging it to be dental caries.

It is conclusive proof that, as a profession, we have not paid enough attention to the cervical region of the periapical negatives that we have been making, for this cervical radiolucency has been before us ever since we have been making roentgenograms, but we did not mistake it for caries until we commenced to make radiodontic examinations of the interproximal type and focus our attention on the cervical region. Figure 1 shows cervical radiolucency in periapical negatives; Figure 2 shows cervical radiolucency in interproximal negatives, while Figure 3 shows cervical radiolucency appearing and disappearing, with variation of the

horizontal angle, in both types of negatives.

It is perhaps excusable to mistake cervical radiolucency for caries once, but after that, it is as unforgivable as to mistake the antrum of Highmore for an abscess cavity.

Differentiation between cervical radiolucency and dental caries is not difficult. To begin with, they do not look alike and, to continue, they are differently located. Cervical radiolucency occurs just rootwise of the cervical line. Proximal caries occurs just at or cervically to the contact point. Figure 4 shows diagrammatic sketches made in an effort to explain why cervical radiolucency occurs.

There is such a thing, of course, as proximal cervical caries (Fig. 5). It is not difficult to differentiate between cervical caries and normal cervical radiolucency. The cervical caries is a type of senile caries, which reminds me to say that, when studying interproximal negatives, we should watch particularly for proximal caries near the contact point up to the age of about 30. After 30, begin to watch particularly for incipient pyorrhea. At about 60, senile cervical caries may start to develop.

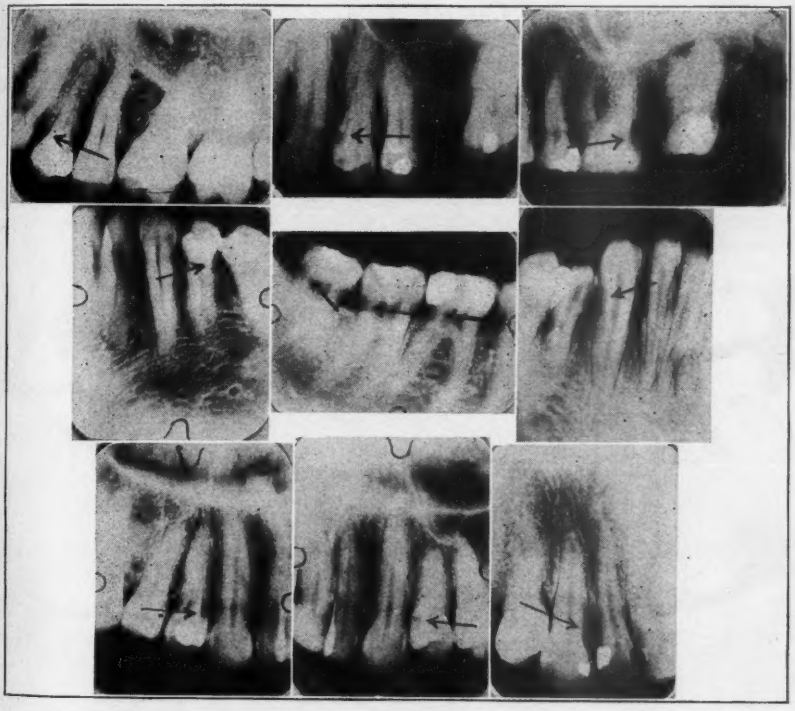

Fig. 1.—Periapical negatives. The arrows point to normal cervical radiolucency.

Having located senile cervical caries, the operator will not infrequently almost wish that he had not, for it is so difficult to excavate and fill such cavities. The handling of such cases when the lesions have been discovered radiodontically is quite different as compared to when they are discovered instrumentally, for the operator has a picture of conditions which he can show and explain to the patient. Thus, the patient is able to comprehend fully just what he and his dentist must face; namely, the necessity of cutting through a great deal of tissue to reach the lesion. Under such circumstances, the understanding and cooperation of the patient is assured. It is a repetition of the history of extracting impacted teeth.

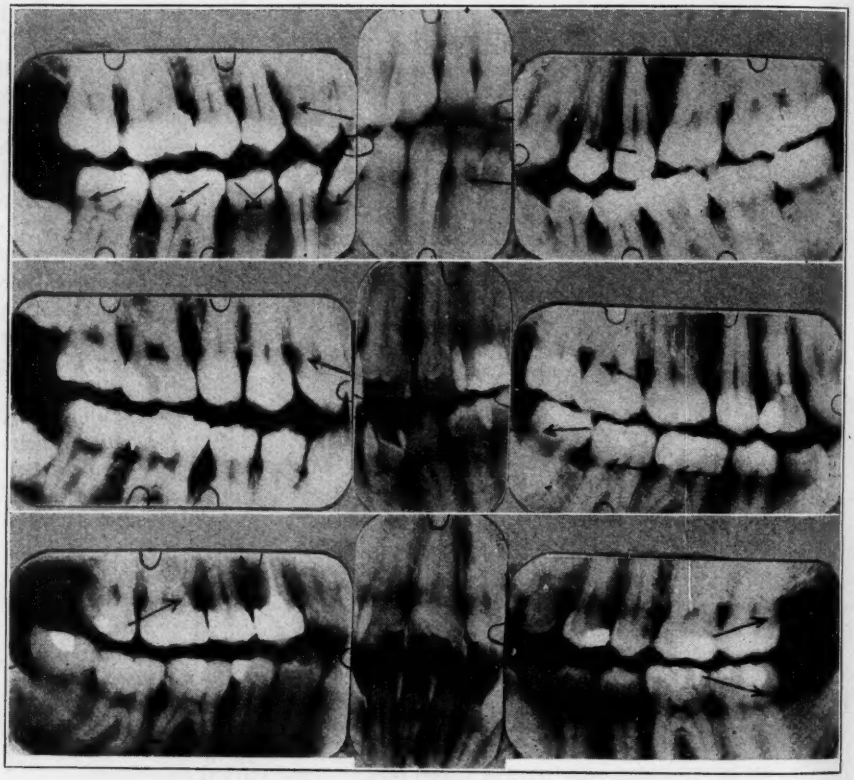

Fig. 2.—Interproximal negatives. The arrows point to normal cervical radiolucency. These roentgenographic prints have been made for the purpose of showing areas of cervical radiolucency in halftones, a difficult thing to do. In the effort to make these areas show, much of the detail in other parts of the negatives has been sacrificed. A radiolucent band passes clear across the tooth from mesial to distal aspect, in the case of the lower right third molar, in the upper right hand negative, bounded above by the discontinuance of the enamel and below by the beginning of the bone.

Radiodontia faithfully employed will finally do as much for operative dentistry as it has for extraction; which is to say that it will remold public opinion of t' art and service involved.

RADIODONTIC STUDY OF PROXIMAL CARIES

Proximal caries, as revealed in roentgenograms, may be divided into four groups or classes as follows: Group 1, those showing only a nick in the enamel. Group 2, those showing a nick in the enamel and a radiolucent zone at the dentino-enamel junction. Group 3, those showing a nick in the enamel with the zone in the dentin now bellying into the dentin toward the pulp. Group 4, those showing a nick in the enamel, the perforation through the enamel and the carious process bellying well into the dentin (Fig. 6).

We may look on these four groups not as different types of proximal caries, but as the same cavity in different stages of ... development. Thus perhaps, it would be ... er to refer to the classifications as stages 1, 2, 3 and 4, rather than as groups or classes.

Stage 2, that stage in which the dentin has just been attacked and has spread along the dentino-enamel junction appearing as a line or a band, is more readily seen in the anterior teeth and bicuspids than in molars. The greater buccolingual thickness of the molars makes it more difficult to see the beginning of caries of the dentin. I do not mean to say that stage 2 cavities cannot be seen in molars, for they can be.

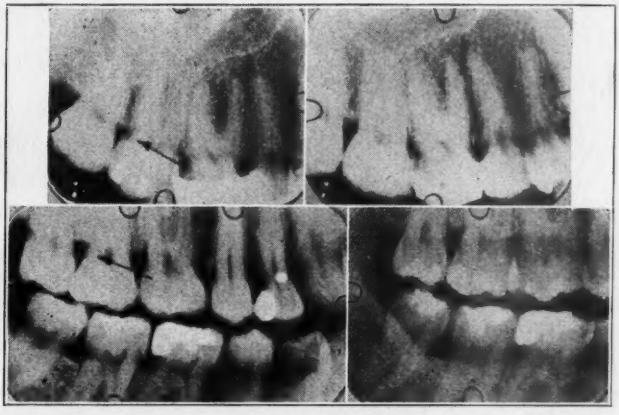

Fig. 3.—Films illustrating the fact that cervical radiolucency may appear and disappear, in both periapical and interproximal negatives, with the changing of the horizontal angle. The upper left hand negative shows radiolucency on the distal of the second molar; the upper right of the same case, made at a slightly different angle, does not show cervical radiolucency on the distal of the second molar; the lower left shows radiolucency on the distal of the upper second molar; the lower right, of the same case, made at a slightly different horizontal angle, does not show cervical radiolucency on the distal aspect of the second molar.

Figure 7 is a diagrammatic sketch explaining why we are able to see the nick

in the enamel and the caries of the dentin underneath, but are unable to see the perforation clear through the enamel.

Whenever the operator sees a nick in the enamel, he should make a careful study of the dentin underneath, viewing the negative in a good even transilluminating light such as sky light, reflected white light or a good view box, and frequently employing a magnifying glass, such as a reading glass. Comparison should be made, if possible, with the same surface in the corresponding tooth on the opposite side of the mouth.

The rule to make a careful examination of the dentin under a nick is reversible. That is to say, if the dentin appears suspicious, a careful examination should be made for an enamel nick. Finding both the nick and a radiolucent zone in the dentin makes the evidence of the presence of a cavity conclusive.

A heavy enamel cap sometimes gives the dentin the appearance of suspicious radiolucency, but this suspicion may be cleared up by comparison with the other teeth in the mouth, for they will all show substantially the same degree of radiolucency.

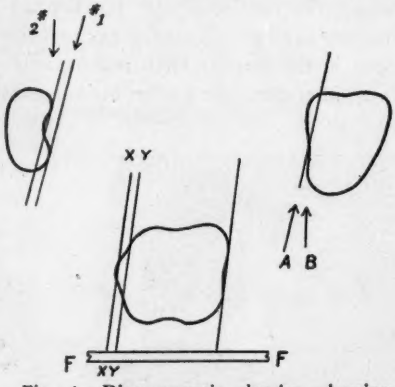

Fig. 4.—Diagrammatic sketches showing why cervical radiolucency occurs in roentgenograms. Cervical radiolucency occurs as a result of extreme concavity (as on the mesial aspect of upper first bicuspids) or extreme convexity, or considerable faciolingual thickness of the tooth with the roentgen rays passing diagonally through the parts. In the case of the upper first bicuspids, for example, if the horizontal roentgen-ray angle is as indicated by arrow 1, the cervical radiolucency will appear as shown in Figure 1, upper left negative and Figure 2, upper right negative. If the horizontal roentgen-ray angle is as illustrated by arrow 2, the cervical radiolucency will appear as shown in Figure 1, upper center negative. Where there is extreme convexity, a radiolucent shadow of the parts may fall on the film as diagrammed between lines *X* and *Y*. With the horizontal roentgen-ray angle as indicated by arrow *A*, radiolucency will occur as shown in Figure 3, left upper and lower negatives. Change the horizontal roentgen-ray angle as indicated by arrow *B* and the cervical radiolucency will disappear as demonstrated in Figure 3, right upper and lower negatives.

Fig. 5.—Senile cervical decay seen on the distal aspect of the upper second bicuspid and mesial of the first molar.

Alfred Walker and others, I included, have called attention to the fact that the conditions revealed on operation, in the case of proximal caries, are almost always worse than one would have been led to expect from the roentgenographic appearance. This is true of periapical findings as well as of proximal caries, and one reason for it is the roentgenogram's lack of perspective, i. e., faciolingual depth. This peculiarity, this tendency to understate the condition rather than overstate

it, is more noticeable in proximal caries in molars than in the other teeth, because of the greater faciolingual thickness of these teeth, which makes it more difficult to see through them radiodontically.

The question arises, can roentgenograms be absolutely depended on to show positively all proximal caries without fail? And the answer is that they cannot be. A small area of proximal caries literally millions of cavities overlooked by ocular-instrumental methods, and they may be absolutely depended on to show all proximal cavities before the cavities become of sufficient size to endanger the vitality of the pulp, which is more than may be said of ocular-instrumental methods.

NEW RULES

One of the greatest problems arising

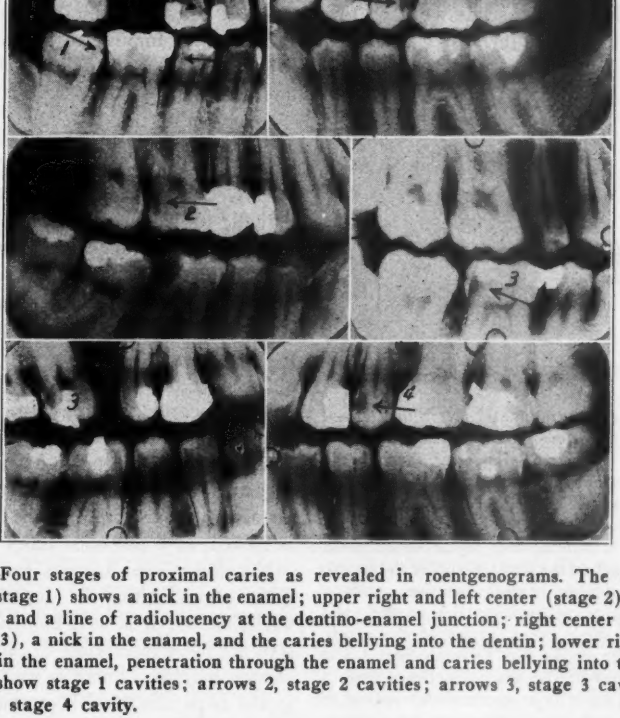

Fig. 6.—Four stages of proximal caries as revealed in roentgenograms. The upper left negative (stage 1) shows a nick in the enamel; upper right and left center (stage 2), a nick in the enamel and a line of radiolucency at the dentino-enamel junction; right center and lower left (stage 3), a nick in the enamel, and the caries bellying into the dentin; lower right (stage 4), a nick in the enamel, penetration through the enamel and caries bellying into the dentin. Arrows 1 show stage 1 cavities; arrows 2, stage 2 cavities; arrows 3, stage 3 cavities, and arrow 4, a stage 4 cavity.

may sometimes appear and disappear with variation of the horizontal angle as cervical radiolucency does. (Fig. 3.) Roentgenograms can be depended on to show from the making of interproximal roentgen-ray examinations is due to excessive efficiency rather than to a lack of it. I mean to say, the examination reveals cav-

ities before they need filling, or perhaps I should be more conservative and make that statement simply as a personal opinion. At any rate, radiodontic examination does reveal what might be termed chemical cavities, that is to say, decalcified spots, before actual physical cavity formation.

If we are not to excavate and fill immediately all caries revealed radiodontically, we must formulate rules to guide us in our decisions as to when to fill and when not to. The same rule will not apply to all teeth. The rules which now follow are not intended to be the last word on this subject. I have previously attempted

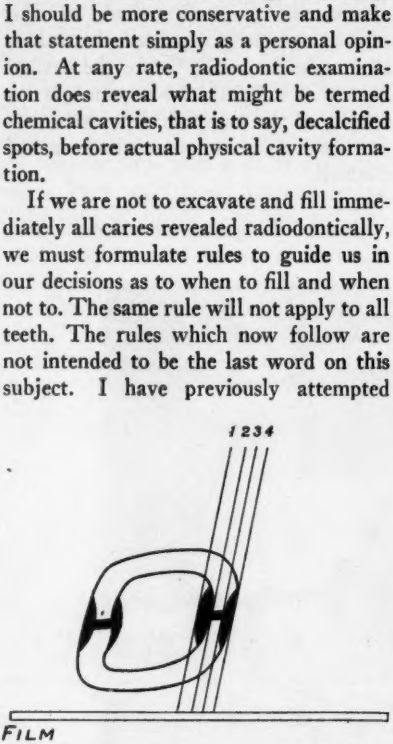

Fig. 7.—A diagrammatic sketch of a cross-section of a posterior tooth calculated to explain why the perforation clear through the enamel does not register even when the cavity is rather large. Seen in cross-section, proximal caries is somewhat like a dumbbell in shape. With considerable tissue involvement of the enamel on the surface and of the dentin near the dentino-enamel junction, with a small isthmus penetrating the enamel and connecting these areas, caries of the dentin will register on the film between lines *1* and *2*, and caries of the enamel between lines *3* and *4*, but there is so much sound enamel to the buccal and lingual aspect of the perforation through the enamel that the perforation will not show between lines 2 and 3.

formulating rules in this connection and have found it necessary, within the last two years, to modify my own rules. The rules given are intended only to help guide our practice in the present emergency. Whether they will stand the test of time and clinical application is something which time alone will tell.

Rule 1 is for the anterior teeth: Fill as soon as an enamel nick is seen, or at least not later than stage 2. Rule 2 is for bicuspids: Fill as soon as dentin destruction is seen, or not later than the beginning of stage 3. Rule 3 is for molars: Fill as soon as any dentin destruction at all can be seen.

These rules may stimulate controversy. It is my own impulse to discuss them at length, but space limitations make this impractical.

RAPIDITY OF DECAY AND FREQUENCY OF EXAMINATION

If we are to keep some lesions under periodic radiodontic observation, instead of filling them immediately, we should know something about the rapidity with which proximal cavities develop, and we must decide the interval of time between periodic examinations.

I believe that I am safe in saying that proximal caries progresses more slowly than those who have not made a radiodontic study of it think. My experience to date leads me to believe that it takes about two years from the time the enamel is nicked, in a posterior tooth, until the cavity commences to pass into stage 3. This generalization is subject to great variation, for it is well known that persons are more susceptible to caries during certain periods. There is variation even in the same mouth. I kept one lesion, in the mesial aspect of an upper left first molar, under observation for five years before it even commenced to pass into stage 3. At the end of two years, an enamel nick developed on the distal aspect

of a bicuspid on the other side of the mouth, and in two more years, this cavity had passed well into stage 3, so far into it that there were regrets, when the cavity was opened, that it had not been filled sooner, though it had not reached the pulp.

A general rule for frequency of periodic interproximal roentgen-ray examination may be formulated as follows: Wherever there is any lesion in the mouth that the operator wishes to keep under observation, examination should be made at least once a year. Where there are no lesions, the time may be extended to two years, but certainly no longer.

In this connection, permit me to pause to say that there is a growing tendency on the part of some to insist that complete periapical examination be made periodically. Where previous periapical examination has been made and it is known that there are no pulpless teeth or other periapical lesions — or their exact location is known—it is not necessary to repeat fourteen-film periapical examinations periodically. One periapical examination is certainly desirable, but after this one has been made, and the purpose of subsequent periodic examinations is to locate incipient caries and pyorrhea, the interproximal examination serves the purpose fully, and to do more than this is to add needlessly to the operator's labor and the expense and roentgen-ray exposure of the patient, and to tend to cast discredit on all radiodontic examination.

ANTERIOR TEETH

A mere enamel nick in an anterior tooth may be filled when the filling of the same nick in a posterior tooth would be contraindicated because of the more convenient access to the lesion in the anterior tooth. To reach such a spot in a posterior tooth might require the sacrifice of considerable sound tooth structure, while such sacrifice would not be necessary in an anterior tooth. It is not uncommon to find as many as ten or fifteen proximal nicks in posterior teeth in the mouths of patients in their teens and twenties. To cut away a sufficient amount of tooth structure to reach all of these nicks in the posterior teeth, and to insert proximoclusal restorations is, in my opinion, absolutely unjustifiable.

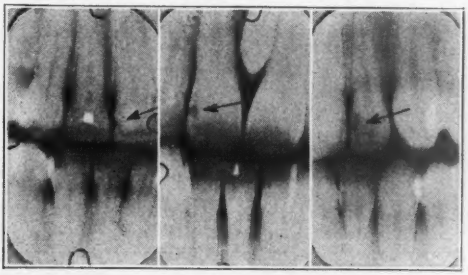

Fig. 8.—Different types of proximal caries in anterior teeth, one showing a nick in the enamel (left), another showing a nick in the enamel with the dentin affected slightly (center), and the other showing the nick in the enamel and evidence of the carious process spreading all along the dentino-enamel junction (right).

On the other hand, proximal nicks in the anterior teeth may be excavated without excessive sacrifice of sound tooth

structure. At this point, let me say that it is my recommendation that these cavities be excavated and filled without extending the cavity margins any farther than necessary to remove all macroscopic caries. I realize that this is heresy, but, as I have said before, new methods necessitate new rules.

Please do not confuse the word macroscopic with "microscopic." Macroscopic caries must be removed. Clinically, we practically never remove all microscopic caries. Nor is it always necessary or desirable to remove what might be termed roentgenographic caries. As soon as caries penetrates the enamel, in an anterior tooth, we can sometimes see evidence of tissue dissolution, caries flaring all along

Fig. 9.—Simple proximal restorations in the posterior teeth (the writer's mouth).

the side of the tooth, appearing as a thin radiolucent line at the dentino-enamel junction. To attempt to remove all of this affected tissue would necessitate removal of the whole proximal side of the tooth, which is not necessary and is distinctly contraindicated.

The treatment of caries of the anterior teeth resulting from periodic interproximal roentgen-ray examination is, clinically, one of the most gratifying things that I know of. I realize that no man who has not used this examination is aware that he needs it to help him to locate proximal caries in anterior teeth. But if he has used it, he has discovered that he has been overlooking cavities by the ocular-instrumental method and that the radiodontic method is much easier and more reliable. Cavities are discovered before the patient dreams that they might be present. The operator is able to show the patient these cavities in roentgenograms so that there can be no doubt of their presence. When these cavities are now filled with silicate cement, without practicing extension for prevention, their presence cannot be detected by either the patient or the casual observer.

This is catching disease of the anterior teeth in the earliest possible stage and holding it there. Patients show a lively appreciation for this sort of treatment of their "front teeth."

POSTERIOR TEETH

When we excavate a proximoclusal cavity, we practically always find the surface of the approximating tooth more or less affected, either simply discolored and etched or with a cavity in it. When I was engaged in the practice of operative dentistry, I found it hard indeed to decide what to do with many of these cases: whether to smooth them off with disks or cut them out, making a spot filling, or make a proximoclusal restoration. At the time of which I speak, I was a rather radical adherent of the practice of extension for prevention, so I usually either smoothed the surface with disks or cut an approximoclusal cavity. I did not, at that time, make simple proximal fillings in posterior teeth. I now believe that my treatment of these cases was for the most part wrong. Roentgenograms show us the utterly impractical nature of attempting to smooth an etched proximal surface; for to remove all of the affected tissue would mean to polish off nearly all the enamel, as the roentgenogram reveals the nicks going half way through the enamel

or farther. To cut out decalcified spots or very small cavities, making proximoclusal cavities of them, I now believe to be a needless and objectionable sacrifice of healthy tissue.

I have asked literally dozens of practitioners and one superintendent of a dental college clinic how they treat the sort of cases now under consideration and the answers have all been the same. They have all said in substance, "You probably will not approve of what I do, but I place simple proximal restorations." Dentistry should either admit that this is proper and acceptable treatment or it should discontinue to practice it. It should not do it and apologize for it. My own opinion is that it is the only correct treatment, that it should be done and that there is no need for apology for it.

When I say that I would have simple proximal restorations in my own posterior teeth in preference to proximoclusal ones, wherever the simple filling could be inserted, it is not a mere figure of speech. In Figure 9, we see three simple proximal fillings in the posterior teeth. It was possible to reach the one in the distal aspect of the first bicuspid because of the shape of the teeth, and the ones in the mesial aspect of the first and second molars were inserted at the time the proximoclusal restorations were made in the approximating teeth. Having had quite a number of proximoclusal restorations placed in my mouth and recollecting the discomfort that I have had, though the work done was always average or above, let me state with the utmost emphasis that the saving of marginal ridges is a most desirable thing for the comfort of the patient and the health of the interseptal tissues. Indeed, I feel so strongly about this that I would have done for myself and, following the Golden Rule, have done for others the following extraordinary thing: If I had a proximoclusal inlay and a small enamel nick developed in the proximal surface of the adjoining tooth, I would have the inlay removed and the nick filled with a simple proximal filling and the inlay replaced, rather than lose the marginal ridge of the tooth adjoining the inlay.

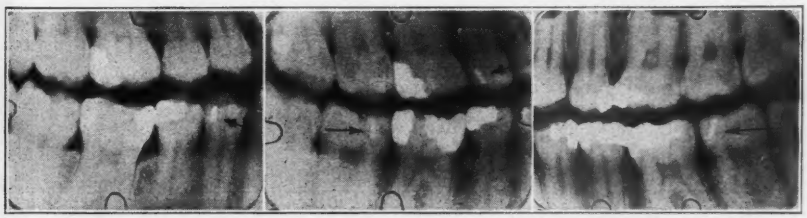

Fig. 10.—Kellogg treatment for incipient proximal caries described in the text. The arrows point to areas after treatment.

In the past, objection was made to simple proximal fillings in posterior teeth on the grounds that there might be a recurrence of caries which would reach the pulp before discovery. In these days of periodic interproximal roentgen-ray examination, this objection is no longer valid, for any recurrence of decay will be seen promptly in the roentgenograms.

SEMIVITAL INFECTED PULPS

Much is being written about what is called the "infected vital pulp," a better name for which would be the "infected

semivital pulp," for the important thing about these pulps is that they are partly dead, necrotic. If such conditions are caused, and it is the belief that they are, by large metallic restorations, it is our duty as a profession to make smaller metallic restorations, and this can be accomplished by finding carious lesions earlier and filling them without too great extension.

I have remarked in the past that the only genuine solution to the pulpless tooth problem lies in prevention. Likewise, the only solution to the semivital infected pulp problem lies in prevention. It is from almost to absolutely impossible to make diagnoses of the latter conditions for they cannot be depended on to cause radiodontically discernible periapical lesions, nor do these pulps give sufficiently abnormal response to electric and thermal pulp testing.

Fig. 11.—Experimental case treated by the Kellogg method. Deposition of silver at the dentino-enamel junction is revealed as a dark area in the photograph.

NEW KELLOGG TREATMENT FOR DENTAL CARIES

When I first recommended keeping carious lesions of the posterior teeth under periodic radiodontic observation instead of filling immediately, I expressed the hope that some treatment might be developed which would stop the progress of these lesions, and pointed out the fact that their progress is stopped by the extraction of an approximating tooth as proving that they can be stopped, if we but knew the right method; for, of course, extraction of the approximating tooth is out of the question.

H. K. Kellogg, of Louisville, Ky., has devised a treatment calculated to stop the development of an incipient proximal cavity in a posterior tooth. Whether this method will prove effective or not remains to be seen. In the meantime, it is something distinctly new in the treatment of dental caries, and as few new things have been devised for the treatment of this disease, it is therefore most interesting.

Briefly described, Dr. Kellogg's treatment is as follows: We take a tooth, the interproximal negative of which shows a nick on the proximal surface. Using a number one-half round bur, we sink a hole from the occlusal surface into the dentin, near the dentino-enamel junction, and alongside the carious enamel nick. Now we use a No. 1 bur, and follow this with a small plain fissure bur about the size of a 20-gage wire. We now adjust the rubber dam including the tooth to be treated and the approximating tooth. A pure gold wire cut a little long is now fitted to the 20-gage well or opening in the tooth, cutting it a little long, and after two or three small crystals of silver nitrate are packed in the well in the tooth, the wire is malleted to place. Ammoniated silver nitrate is now used externally, a drop of it being deposited in the embrasure and carried through into the contact point with ligatures, followed by formalin (solution of formaldehyd), as usual for reduction.

The use of the ammoniated silver nitrate and solution of formaldehyd is of course not new, but attacking the nick from the inside, as well as the outside, is new. Figure 10 shows some of Dr. Kellogg's cases after treatment and Figure 11 is a photograph of an experimental case in which the side of the tooth has been cut away after treatment, the area of deposition of metallic silver deposited from the silver nitrate being thus shown.

In April, 1930, Dr. Kellogg had been carrying on his experiments for eighteen months and had treated 700 cases. The time is, of course, too short to come to any definite conclusions, but there can be little or no doubt that this treatment tends to retard the progress of the decay: it is only a question of how long it will retard it.

Perhaps we have in this Kellogg treatment the ideal one for proximal caries of deciduous teeth. The difficulty of making good proximoclusal restorations in temporary molars is only too well known. If the lesions in the posterior temporary teeth are discovered early and treated by the Kellogg method, there is good reason to hope that this treatment may arrest the progress of the disease until time for the loss of the tooth.

On finding a nick in the enamel of a posterior tooth, it is sometimes very difficult to decide, from a study of the roentgenogram, whether the underlying dentin is affected, especially if the operator has had limited experience in this kind of radiodontic interpretation, or if the negatives are of mediocre or inferior quality. Perhaps, under such circumstances, the thing to do is to sink a well, from the occlusal aspect, as in the Kellogg treatment, and if the dentin is found to be seriously involved, make a proximoclusal restoration, and if not, use the Kellogg treatment. In this connection, let me say that I have known dentists who habitually attack small proximoclusal cavities, for excavation, from the proximal aspect. I assuredly do not profess to be an authority on operative technic, but this seems entirely wrong to me. If, after sinking the Kellogg well in the tooth, there is found to be an involvement of the dentin, and decision is made to cut a proximoclusal cavity, a small fissure bur may be used to extend the Kellogg well buccally and lingually, until the buccal and lingual walls of enamel are undermined, when they may be chipped off with a chisel. This is the method which I used when I practiced operative dentistry, and I am certain it is better than attacking these cavities from the proximal aspect; but perhaps there are stones or disks made now with which I am unfamiliar and which are more suitable for this work.

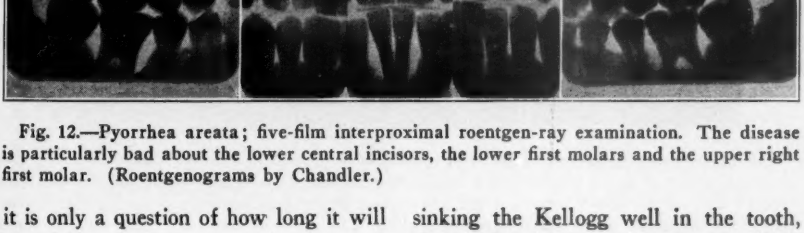

Fig. 12.—Pyorrhea areata; five-film interproximal roentgen-ray examination. The disease is particularly bad about the lower central incisors, the lower first molars and the upper right first molar. (Roentgenograms by Chandler.)

I hope that the reader is seeing, as I have been seeing for so long, that the periodic use of the interproximal roentgen-ray examination is destined to modify, improve and perhaps even revolutionize the practice of operative dentistry. When I say revolutionize, I do not mean a sudden and irrational abandonment of old and reliable things, but a gradual and intelligent rearrangement and modification of them.

PYORRHEA AND THE INTERPROXIMAL ROENTGEN-RAY EXAMINATION

Those who have done me the honor of reading what I have written in the last few years realize that I have had little indeed to say about pyorrhea in connection with the interproximal roentgen-ray examination. The reason for this has been that it was my chief aim to recommend this examination as a means of preventing toothache and pulp death. This prevention lies within our certain grasp. The prevention of pyorrhea is more problematic, but the time has arrived, I believe, for me to give the subject more consideration.

It is obvious that the interproximal roentgen-ray examination lends itself well to an examination for pyorrhea. The vertical angle at which it is made is indeed more favorable than for most of the teeth in the regular periapical examination. The examination is perhaps most useful in what might be termed pyorrhea areata, that is to say that form of pyorrhea in which some certain teeth are excessively involved while others are practically free from the disease (Fig. 12).

But I am more concerned with incipient pyorrhea, cases showing calculus but, as yet, showing little involvement of the alveolar crests. In these cases, it is my hope that the removal of the calculus may prevent the development of the pyorrhea to the point now so well known to us, where it is beyond our effective control.

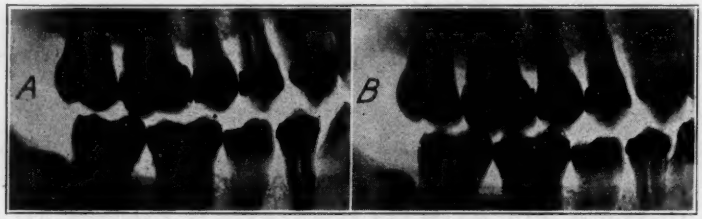

Fig. 13.—*A*, roentgenogram made after unsuccessful gesture at scaling. Calculus can be seen on distal aspect of upper first bicuspid, second bicuspid, first molar and mesial aspect of second molar; also on the distal aspect of the lower first molar and mesial aspect of lower second molar. *B*, negative made after effective scaling. The calculus has been removed. It seems within the range of possibility that it may be found necessary to check scaling of teeth as it has been found necessary to check canal surgery.

Some years ago, we as a profession became aware of the necessity of "checking pulp canal work." The end-result has been that roentgenograms have been used not only to check pulp canal work but, if you will permit me the pun, nearly to stop it. In brief, we have met the necessity of checking pulp canal work by discontinuing the work.

I believe that the time is at hand now when we must commence to check the scaling of teeth radiodontically—and we can't abandon this, we must scale teeth. And since the work is destined to be checked radiodontically, we are going to have to scale teeth better than we have in the past. My fervent hope is that, as the necessity for actually removing the proximal calculus develops, we may gain sufficient skill in its removal that we will not do more damage by removing it than by leaving it.

Figure 13 shows two roentgenograms of an interesting case. The first one was made immediately after scaling by a dentist who was striving to make a reputation for himself as being an "easy dentist with a gentle touch." You will observe that plenty of proximal calculus has been left, noticeably on the distal aspect of the upper first bicuspid, second bicuspid, first molar and mesial aspect of the second molar; also on the distal aspect of the lower first molar and mesial of the lower second molar. Figure 13*B* was made immediately after a second scaling by another dentist. This time, the calculus is removed.

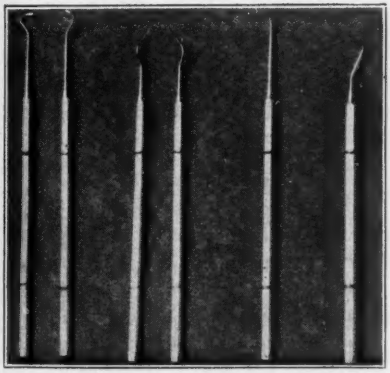

Fig. 14.—A simple set of scalers used most effectively by Frank Hamilton. An additional instrument has been added to this set since this photograph was made. It is known as 25 T Hu-Friedy Corona. (The writer's experience in the checking of scaling has not been broad to date, but what experience he has had leads him to believe that unless the operator uses a pair of instruments similar to the Younger-Good scalers, third and fourth instruments from the left in the illustration, he fails almost completely to remove proximal calculus from posterior teeth.)

My experience has been limited, but it is that operators who do not use a pair of scalers like or similar to the Younger-Good scalers, third and fourth instruments from the left, Figure 14, fail almost completely to remove posterior proximal calculus.

Two more things seem to need to be said in this connection at this time: one is to admit the fact that roentgenograms do not show all calculus, not even all proximal calculus. An exceptionally good operator not infrequently will find and remove proximal calculus when no hint of it is seen in roentgenograms. But—and this is the other thing I wish to say—if we, as a profession, will develop the art of scaling to the point where we remove all proximal calculus shown in the roentgenograms, we will be doing this work very much better than it has been done in the past, and if calculus does cause pyorrhea, its more certain removal, brought about by checking our efforts radiodontically, will be the most effective thing we have ever done to prevent pyorrhea.

DETAILS VERSUS FUNDAMENTALS

When I tell you that, in this long paper, I have touched only on the more urgent phases of the subject and have dealt with them briefly, in spite of the length of the paper, you will see, I hope, the size of the subject. Interproximal

roentgenograms are, in brief, bringing up the whole subject of operative dentistry for reconsideration, which, in my opinion, is a most excellent thing.

Most dentists assume that they know absolutely all there is to be known about operative dentistry and will scarcely talk about it, but spend much time talking about the extraction of innocent impacted teeth, and the removal of even more innocent intra-osseous radiopaque and radiolucent spots seen in roentgenograms.

Dentistry's greatest opportunity for service lies in the field of operative dentistry, and dentistry's greatest opportunity for improving the quality of its work lies in this field also.

Operative dentistry needs to win greater respect both from dentists and the public, and the continued use of roentgenograms gives fine promise of developing this better understanding and respect. The filling of a tooth must be accorded the importance it really has. It must be looked on for what it really is, a treatment of disease, a very serious disease if it is not treated. And, let me say, there is no treatment for disease known to mankind which is more effective than filling teeth. We find a cavity in a tooth. If it is neglected, this disease is destined to reach the pulp, the osseous structures of the jaw and the vital internal organs of the body. We excavate and fill this cavity and the disease is stopped right there for a year, two years, ten years or a lifetime. It is a fine and important thing to do. We need to realize this more keenly. Let the importance of the thing be realized, and the more liberal monetary reward will take care of itself.

And so I come again to the point that I always reach in the discussion of this subject. The technical problems, new rules and new methods of practice which I have discussed are all simply details, of interest enough, of great interest to us as professional and technical men, but having little importance as compared to the broader conception of what the interproximal roentgen-ray examination stands for. I mean to say that as we consider technical details, we should not forget the main purpose of the interproximal roentgen-ray examination, which is to prevent systemic disease resulting from focal infection. The faithful and intelligent periodic use of the interproximal roentgen-ray examination insures the prevention of at least 90 per cent of periapical infection which has been allowed to occur in the past. No other source of focal infection is it so definitely within man's power to prevent. Therefore, there is no other opportunity to prevent disease originating from focal infection like this one. It is an enviable opportunity for dentistry.

CONCLUSIONS

1. Radiodontia has already had a marked effect on operative dentistry, but since the advent of the interproximal roentgen-ray examination, an even more extensive influence will be exerted.

2. New methods not only develop new possibilities but new problems as well.

3. The common mistake in the interpretation of interproximal roentgen-ray negatives is to regard normal cervical radiolucency as dental caries, but differentiation between caries and cervical radiolucency is not difficult.

4. Proximal caries, as revealed in roentgenograms, may be divided into four groups or stages as a convenient means of designating the types of cavities revealed.

5. The extent of the caries revealed on operation is usually greater than one would have suspected from radiodontic findings.

6. Roentgenograms do not show absolutely all proximal caries always, but they do show millions of cavities which escape detection by ordinary ocular-instrumental examination, and no proximal cavity can ever escape detection in good roentgenograms until the vitality of the pulp is in danger.

7. The trouble one has with roentgenograms as a means of locating proximal caries is due to too great efficiency, rather than too little, in view of the fact that carious areas are revealed where immediate filling is contraindicated.

8. Radiodontic study of proximal caries teaches us that the progress is not so rapid as is commonly supposed.

9. The interval between periodic interproximal roentgen-ray examinations should ordinarily be one or two years, depending on the case.

10. The continued clinical use of the interproximal roentgen-ray examination reveals to us the need of revising certain rules governing the practice of operative dentistry.

11. The only solution to the semivital infected pulp problem is to find and fill cavities when they are smaller.

12. Dr. Kellogg offers us something new in the treatment of incipient caries.

13. The periodic use of the interproximal roentgen-ray examination holds out hope of curing pyorrhea in its incipiency.

14. The necessity of checking pulp canal work radiodontically may spread to include checking scaling radiodontically.

15. Correct instruments are necessary to remove proximal calculus from posterior teeth.

16. The filling of teeth is a curative and preventive treatment of disease and one of the most effective treatments known to mankind.

17. In the whole realm of medicine, there is no other opportunity to prevent focal infection such as dentistry has.

18. Periodic use of the interproximal roentgen-ray examination brings up many clinical problems, but we should not allow these problems to obscure our clear vision of the main purpose of such examination, which is to prevent focal infection and systemic disease originating from such infection.

ADDENDUM

Since attending the meeting of the Chicago Dental Society in February, 1931, I feel the urgent necessity of adding just a few words to this paper because some of the things discussed in it were discussed by several essayists and clinicians at the meeting. Incipient proximal caries in posterior teeth (enamel nicks) not extensive enough to justify proximoclusal excavation and filling is assuredly a challenge to every thoughtful dentist. That dentistry is accepting the challenge and making efforts to discover a satisfactory solution is evidenced by the work not only of Dr. Kellogg but also of others. Prominent among those who discussed the matter at the Chicago meeting was Weston A. Price, who submitted roentgenographic evidence that proximal caries may be retarded, perhaps even stopped, or made to progress more rapidly, by variations in diet. Norman L. Kettlewell displayed roentgenograms showing the retarding effect of the application of silver nitrate, exhibiting one case, I recall, in which there were enamel nicks on both proximal surfaces of the same tooth, one side of which was treated with silver nitrate, the other not treated, and showing the side receiving no treatment extensively diseased, with but little or no progress of the disease on the treated side. Dr.

Kettlewell also demonstrated, in his clinic, a new and unique method of excavating a proximal cavity in a posterior tooth, with the approximating tooth in position, "without going through the marginal ridge." One wonders how such excavation could be made and tries to visualize a new attack from the buccal or lingual aspect. Dr. Kettlewell's surgical approach is quite different. He makes an opening from the occlusal surface something like the Kellogg well but entering farther from the marginal ridge and traveling diagonally to the lesion on the proximal surface and extending clear through the surface. Thus, after excavation, there is an opening on the occlusal surface running clear through and on to the proximal surface. A matrix is adjusted over the opening on the proximal surface and the cavity filled from the occlusal. When finished, the surface appearance is that the tooth has a simple filling on the occlusal and another on the proximal. If I understand Dr. Kettlewell, he, like Dr. Kellogg, makes no especial claim for the value of this method. He submits it only for what it is, another effort in a struggle to meet an important situation arising from the continued use of a new agent of observation, the interproximal roentgen-ray examination. It was suggested by another operator, from Battle Creek, whose name I unfortunately cannot recall, that a "slice" proximal inlay preparation might be made, extending the excavation at the lesion farther into the tooth if necessary and filling this excavation, thus removing all diseased tissue and obtaining the advantages of extension for prevention with the minimum of sacrifice of tooth structure. All of these suggestions deserve careful consideration.

METHODS OF TRANSMISSION OF VINCENT'S INFECTION

By FRANCIS H. DALEY, D.M.D., Boston, Mass.

VINCENT'S infection is a communicable disease. The degree of infectiousness depends on the virulency of the organisms and the relative tissue resistance of the individual at the time of exposure. Without doubt, we are constantly exposed, to the disease, but it is only when all conditions are favorable that the characteristic lesions of the disease develop.

Personal contact is probably one of the outstanding factors in its transmission. Kissing has, in many cases, been proved to be directly responsible. The exchange of personal articles, such as pipes, cigarets and lipsticks, will result in the infection of susceptible individuals. Drinking glasses, and eating and cooking utensils, if improperly sterilized, may be included as factors. The condition may be spread if several persons drink from the same bottle. We have seen scattered instances of this character.

In many cases, we have had to investigate quite thoroughly before finding a contaminating influence. Handshaking was apparently a factor in one instance. In another case, infection was transmitted

by two individuals chewing the end of the same pencil. The telephone mouthpiece has been responsible in enough cases that we can call it a tangible factor.

Much discussion on the subject of carriers is found in the literature. There is no doubt that the individual with a low-grade chronic type of infection may spread the disease. However, there is this point to remember: Since everyone probably has the organisms in the oral cavity in greater or less numbers, we may all be carriers. We believe, as does Davis, that the organisms are "opportunists," and that even the more virulent strains are harmless until the barrier of tissue resistance has been destroyed.

In considering the endemic possibilities of Vincent's infection, it is interesting to note when these outbreaks have occurred. It is also of interest to note the different months or seasons of the year when the disease seems to be more prevalent.

There is no question that the attacks which occurred among the troops in the trenches were caused primarily by a lack of resistance. This is general when men have been living under poor sanitary conditions, with a deficient and irregular diet, lack of sleep and high nervous tension, and with no adequate means for proper mouth hygiene. The soldier returning from France has been blamed for the outbreaks which occurred in this country during the last few months of the War and shortly after the War was over. There is no doubt that some of the blame should be placed here, but we have often wondered if the epidemic of influenza might not have been equally responsible. We have noted that some of these rises in the incidence of Vincent's infection follow very closely on the reports of other endemic diseases such as influenza. We have noted also that the number of cases tends to increase during the months when respiratory diseases are prevalent.

As to the possibility of endemic spread of mouth diseases, it may be of interest to know that Sotolongo, of Havana, Cuba, stated, in 1910, that Brotonneau of France reported concerning an endemic spread of an oral disease which he called "stomatitis ulcero-membranosa." This occurred in the Army de La Vendee at Tours, France, in 1828. Moussu, at about the same time, recorded the case of a soldier who infected himself from a pipe, and, in turn, transmitted the infection to five of his comrades. We cannot say, of course, that this was the disease which we recognize as Vincent's infection. The manner of transmission seems to simulate that of Vincent's infection.

As a matter of routine, we warn any patient with a positive Vincent's infection to isolate himself as much as possible not only from members of his immediate family, but also from business associates. He is warned to see that no one else uses eating utensils used by him and to have these utensils scalded after using. He is told to reserve a towel for his own particular use and to have this boiled every day. He is told to avoid personal contact of any kind. The patient must be thoroughly impressed with the importance of these instructions, particularly if there are children in the family. If there are children about, he should keep his toothbrush and all other personal articles beyond their reach. The patient must also be warned as to the danger of infecting other mucous membranes. Vincent's infection will attack any mucous membrane having a break in its continuity. Cases of the disease occurring under the fingernail, in the nose, in the eye, in the ear, on the penis, in the vagina and even in the intestinal tract have been reported.

The dentist who treats cases of Vincent's infection must always guard against infecting himself or infecting other patients who come into his office. When dealing with a case of the disease, he must use as few instruments as possible. The more instruments used, the greater the chance for contamination. He must guard against placing his fingers on his own lips or rubbing his eye. Before answering the telephone or any similar action, he should be careful to wash his hands thoroughly. After treating a patient for Vincent's infection, he should be doubly careful in the sterilization of his instruments. They should be boiled for at least one-half hour. All napkins or towels used on the patient should be discarded. Some men use paper napkins on the instrument tray. This is a very good thing, if the napkins are thrown away immediately after each patient is cared for. Some dentists attempt to economize by using one napkin for two or three patients. Some will use the same waste receiver until the cardboard top is soggy from saliva and débris. This is anything but economy from the standpoint of good dental service, and we believe that some cases of Vincent's infection may be traced to just such practices.

When the disease is cured clinically and smears of the affected areas are negative, the patient is warned to burn his toothbrush. Many cases of reinfection have occurred because of failure to carry out this procedure.

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C. N. JOHNSON, Editor

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Editorials

DENTAL JOURNALISM

In the current issue of THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION, there is an article on page 644 entitled "The Present Status of Dental Journalism; the Rôle of Editorial and Advertising Policies in the Campaign for Reform of Proprietary Dental Advertising."

While it is usually not our custom to comment editorially on topics presented in our reading pages, the pointed references in this article dealing with the policy of our own JOURNAL make it incumbent on us to take brief cognizance of the matter at this time. We have no disposition in the least to enter into a controversy on the points at issue, but we venture to hope that there may be a slight clarification that shall be helpful to all.

To epitomize the contentions made by the writer of this paper they may be summed up as follows: The baneful influence on the

profession of so-called "trade journalism"; and the present unfortunate condition of our own official organ with reference to its editorial and advertising policies; together with other various and sundry reflections which have been unceremoniously dragged into the open for pious ventilation in the attempt to reform and revolutionize the entire fabric of dentistry with one fell swoop.

In the language of one of our noted men, "Let's reason the thing a minute." In the first place, is it true that trade journalism is such a hydra-headed monster as we have been led to believe? What about the days long before the establishment of any of our independent journals? Is it not pertinent to remark that those early trade journals produced a periodical dental literature that was in every way worthy of our best traditions? Without them, there would have been no literature at all, and shall we have the temerity to contend that it were better to have none than to have the literature we possessed for nearly half a century? It rests with ill grace to besmirch the names of some of the noble men of the past who have contributed honor and dignity to the editorial councils of the profession in those days; as it also reflects on the ethics of equity and propriety to speak in these latter days of "indulgence in a sort of 'free lunch' type of journalism, and what amounts to almost a system of racketeering in connection with the financing of our large conventions."

We hold no brief for some of the practices that have crept into journalism and into dental associations. As with every other enterprise under the sun, there are certain ulterior influences that cannot be condoned, but it is a far cry for some of our critics in the profession—and out of it—to shout "Wolf! Wolf!" and make intemperate insinuations about racketeering. It savors too much of that reprehensible practice of muck-raking, and muck-raking in professional life is not a creditable thing; it tends neither to constructive reform nor to propriety.

It need not be stated that as far as our JOURNAL is concerned, we line ourselves unreservedly on the side of independent journalism. By predilection and in principle, we are manifestly whole-

heartedly in favor of it, as must be too apparent for any quibble. It is the very bone and sinew of our professional faith, and we hope to see it grow abundantly in stature and in grace. It is not saying too much to state that we are devoting the very best energy of our existence to its constructive development and we are proud of every advance that is recorded; but this does not imply that we are justified in superciliously turning our back on the past, or in ungraciously biting the hand that has been feeding us.

Dentistry considered in the light of its organizations and particularly of its independent periodical literature is young in years and more or less limited in its traditions. It cannot run before it walks, and there is grave danger that in the frantic advocacy of the "militant" policy so greatly beloved of our critic, the net result will be more quixotic than constructive. There is too great a tendency to tilt with windmills in some of our attitudes and to merely make ourselves look ridiculous. We may easily do more harm than good by our sensational straining for effect; and the practice of running amuck with our criticism may ultimately prove our undoing.

We think that we can logically claim a steady improvement in the character of our journalism. Of necessity, it must be of gradual evolution lest the "growing pains" to which reference has been made turn out to be a fatal malady. Let us not tear down faster than we can build up.

As to our editorial policy, we are grateful for one concession. While rather grudgingly given, there is still an implied acknowledgment that some of the "inspirational" is needed in our literature. In other words, it cannot be all science. It cannot be for two very good reasons; first, because there is not enough of original, authentic and pure science produced in our profession to adequately fill our pages, and, second, because it would never be read if there were. You may be able by a good deal of persuasive effort in the way of coaxing and the lash to lead a horse to water, but you cannot make him drink—more than he cares to. Forced feeding of any kind tends only to stagnation, and it were better that we

aim to assimilate our science in a reasonable way as we go along, particularly in view of the fact that so "many of the facts that we have found out are not so."

Above all things, let us strive for balance in our deliberations and in our literature. Let us be generous, let us be charitable, let us be consistent, but do not let us pursue the foolish policy of advocating a lot of measures that are wholly impractical just because we have become obsessed with an itch for criticism based on ignorance of the real essence of the situation or the real needs of the profession.

The limitations of space needed for other departments in this issue make it necessary to defer the discussion of that very important subject, the Council on Dental Therapeutics, to another number. It will be considered with due care and deliberation because of its great importance and the promising possibility of the signal service that may be rendered by it.

INCREASED MEMBERSHIP IN THE AMERICAN DENTAL ASSOCIATION

In the State Officers Conference, Feb. 1, 1931, the President, Dr. Oliver, stressed the need of securing a largely increased membership of our Association as rapidly as possible. It seems difficult to ascertain with accuracy the exact number of dentists in the United States, but it is relatively about double the number of those who are members of the American Dental Association.

More and more, we must be impressed with the value of organization in dentistry, not only to the individual member, who really receives much of his professional inspiration through this medium, but also to the profession as a whole. Without organization, dentistry would achieve a very feeble status in the estimate of the world, and the larger the membership, the more impressive becomes our status.

Therefore, membership really constitutes itself a decided asset in more ways than one, and we must concentrate on the problem of increased membership in every legitimate way in our power. While an aggregate of approximately 36,000 is no mean achievement for our Association in a profession as relatively young as dentistry, there still remains the reflection that there is altogether too much uncultivated soil, or, in other words, too many practitioners who are without membership.

It is true that there are some men who are outside the pale of professional respectability and rectitude, and who are fundamentally unethical. Much as we would like to reform such men and render them eligible, there is always a certain percentage that do not lend themselves to reform. With these, there is only one alternative—we are obliged to exclude them from membership.

But there is an appreciable percentage of other men still unaccounted for—those who, while not members, are eligible in every way, or who could readily be made eligible by the proper influence and encouragement. It is these men on whom we wish to concentrate in our effort to increase our membership, and the burning question at this time is, how may this most acceptably be done?

Manifestly, it must be through the medium of recruiting the ranks. Mostly, it must be accomplished by personal solicitation from our component members. In every state or local society, there should be a membership committee whose duty it shall be to canvass the lists of available practitioners and solicit members. It is close personal contact with men that wins their allegiance, and encourages them to accept membership. A personal appeal to an indifferent or wavering member will accomplish more than all the high-flown arguments that can be advanced.

And then the members themselves must devote their best energies to perfecting their organizations and keeping the interest alive so that the new men will at once find an incentive for active and intimate participation in the affairs of the society. And, in a general way, it may be said that there is a very encouraging activity in most of our societies at this time. We believe it is actually a fact

that there never was a greater aggregate attendance at our societies or a more sustained interest in our meetings than is manifest at the present moment. What we now need is to maintain this progress and vivify it with the constant influx of new blood.

Speaking of new blood: there is one medium for recruiting members that must be cultivated more assiduously than it has been. We must school our dental students during their entire college course in the idea of association membership. These coming graduates form the most fertile soil for the acquisition of the very best type of professional manhood, and we are losing a golden opportunity if we fail to take advantage of the great privilege presented in the annual addition to our ranks through the medium of graduation.

Organized dentistry means more than any other single thing in the development of our profession, and never before in our history has this been apparent more fully than it is today. Let us cultivate the new members in every legitimate way, for be assured that we shall need them in the days to come.

MAY DAY FOR CHILDREN

The American Child Health Association, in establishing the institution of May Day, is doing a signal service for the children of the nation. Whenever and wherever children are born, they involve a responsibility, and when this responsibility is not assumed by the faithful and loving care of parents, it must be assumed by someone else. Various agencies and means are at work to fill in the breach between efficient parental care on the one hand, and the appalling handicap of poverty, neglect and wilful dereliction of duty on the other.

To the best of its ability, the American Child Health Association is supplying the indicated need. May Day may be said to be the red letter day of the year in its appeal to welfare groups and

the masses at large. The keynote for May Day this year is "Community Responsibility and Cooperation for Child Health and Protection."

To the furtherance of this idea, we should concentrate on this splendid institution till, in the fullness of time, every one of our thinking citizens shall be made child conscious in a constructive and helpful way. Let us herald May Day as an outstanding effort in the general betterment of our child population.

PANEL DENTISTRY AGAIN

This brief editorial note is introduced on account of some inquiries as to what is meant by "Panel Dentistry." To make an authoritative statement, we have requested Mr. A. M. Simons of the Committee on the Study of Dental Practice to formulate a reply. It is as follows:

"The phrase 'panel system' as applied to dentistry has been taken over from the method by which physicians handle insurance practice in England. Each physician indicates by a notice whether he wishes to do insurance practice. If so, he is placed on a list called the 'panel.' Dentists are not required to give any such formal notice, and hence, although the phrase is used in English dental journals, the phrase is not strictly applicable to dentistry.

"Practice under the various sickness insurance systems has come to be known in the United States as 'panel dentistry,' although there are wide differences in various countries and in few is there anything closely resembling the English system for physicians. Any insured person in England may present his 'dental letter' from his insurance society to any dentist. The dentist may refuse him, but if he does accept him, he must do so under the schedule of fees agreed on by the insurance societies and the dental associations, and will receive his fee from the society."

THOMAS P. HINMAN, D.D.S., F.A.C.D., Sc.D.

(1870-1931)

Thomas P. Hinman was born March 4, 1870, at Stratford, Canada; died March 19, 1931, at Atlanta, Ga.

Dr. Hinman's family moved to the United States in 1871 and he was educated here. In 1891, he received the degree of D.D.S. from the Southern Medical College. He was a charter member of the American College of Dentists. In 1924, he received the honorary degree of Sc.D. from the University of Georgia.

Dr. Hinman was an ex-president of the Georgia State Dental Society, the American Dental Association and the Southern Branch of the A.D.A. He had many interests outside the profession, being the director of the Fourth National Bank, the Joint Stock Land Bank, the Atlanta Steel Corporation and Exposition Cotton Mills, and president of the Hand Trading Company and Farmers Bank, Pelham, Ga.

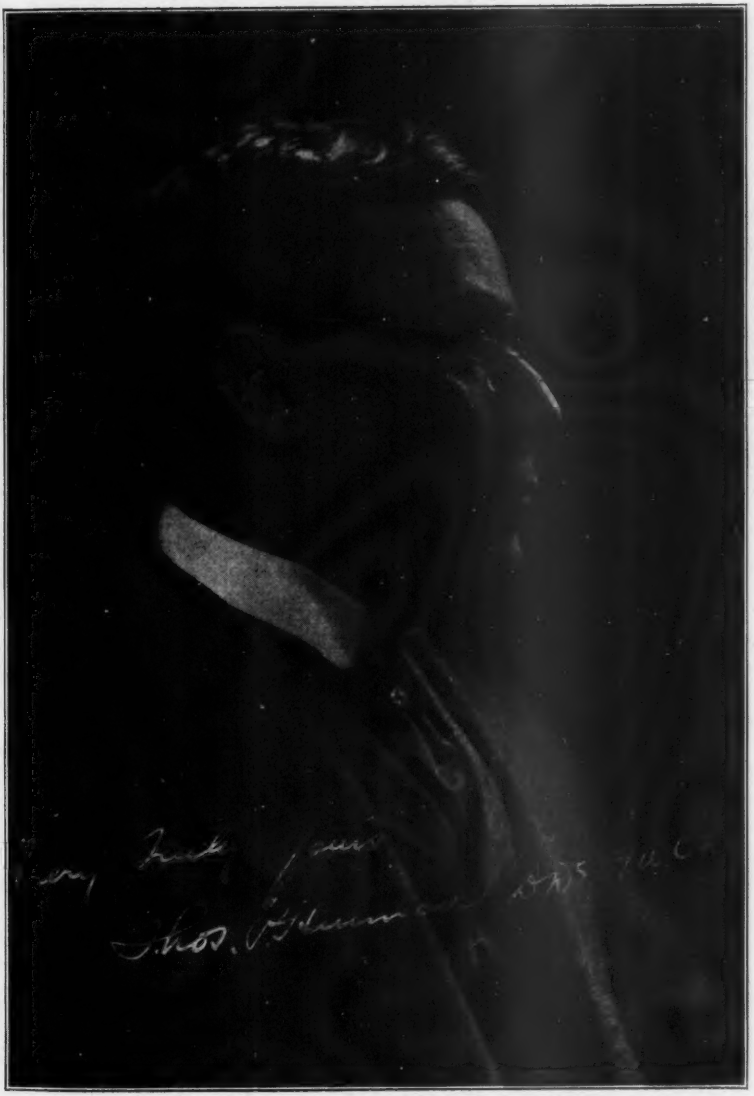
He was greatly interested in golf, and was at one time greens secretary of the U. S. Golf Association, and president of the Druid Hills Golf Club. He was also interested in art, and was director and chairman of the House Committee of the Atlanta Art Association.

He was a member of the Delta Sigma Delta fraternity, and a corresponding member of the American Dental Society of Europe; a member of the Presbyterian Church, the Capital City Club, the Atlanta Athletic Club and the Piedmont Driving Club.

Dr. Hinman was one of the outstanding members of the dental profession. He was interested particularly in oral surgery, and for many years he conducted an extensive practice. He was a well known teacher, and was dean of the Atlanta-Southern Dental College. He made a success of every enterprise with which he became associated.

In 1899, Dr. Hinman married Miss Florence Hand of Pelham, Ga. One son, Thomas Philip, Jr., was born of the union. The other survivors are a sister, Mrs. John Lawrence of Rome, Ga., and a brother, George Hinman of Atlanta.

Dr. Hinman's active and well-rounded life has been a distinct asset not only to his family and his profession, but also to the world at large, and his many friends will miss the sustaining influence of his perennial good fellowship and his never-failing helpfulness.



THOMAS P. HINMAN, D.D.S.. F.A.C.D., Sc.D.
(1870-1931)

COUNCIL ON DENTAL THERAPEUTICS

EPINEPHRIN

The following articles have been accepted by the Council as complying with the rules. A copy of the rules which govern the Council in the consideration of articles for A. D. R. will be furnished on request.

SAMUEL M. GORDON, *Secretary.*

EPINEPHRIN, U. S. P. — Epinephrina (Epinephrin). (Adrenalin).—*laevo*-methylaminoethanolcatechol. ($C_9H_{13}O_3N$.)

Properties.—Epinephrin is a white or light brownish, microcrystalline, odorless powder, gradually darkening on exposure to the air. It is very slightly soluble in water and in alcohol. It is insoluble in ether, chloroform and acetone, and in fixed or volatile oils.

Epinephrin, the active principle of the suprarenal gland, is extensively used in dental surgery and general surgery and to a less extent in medicine in the form of 1:1,000 solution of epinephrin hydrochlorid. Both the substance and the solution (solution of epinephrin hydrochlorid) are official in the U. S. P., which carries tests for identity and purity. The alkaloid, in addition to being obtained from the suprarenal gland, is also prepared synthetically, and such preparations, if they are levorotatory, are as active as the natural product. Artificial epinephrins which are optically inactive have also been prepared. These are only about half as active physiologically as natural epinephrin. Dextrorotatory epinephrin is still weaker, having about only one-twelfth to one-eighteenth the activity. A number of related compounds have been prepared, but up to the present time, only epinephrin has found extended usefulness in dentistry. (Reports of the Council: Epinephrin Substitutes and Reactions in Local Anesthesia, THE JOURNAL, December, 1930.)

Actions and Uses.—Epinephrin has a variety of therapeutic uses. The characteristic effect may be observed on injection into a vein. It acts peripherally on a variety of structures by stimulating the myoneural junction of the sympathetic nerve endings. The extended use of epinephrin in dentistry is due to its local effects on the vessel by virtue of its vasoconstrictor properties. It induces complete contraction of the vessels in any part to which it is applied, and furthermore it has practically only local effects unless injected directly into the blood vessels. Almost complete bloodlessness of a part may be obtained by subcutaneous injection without significant alteration of the blood pressure and without irritation. This property has been responsible for the use in dental surgery of the drug which is now widely used as a component of local anesthetic mixtures for dental operations. When so used, it not only insures a bloodless field for operation, but

also limits the absorption of the anesthetic and prolongs its action. This action is not a true synergism, but rather delays diffusion and dilution of the anesthetic agent by too rapid absorption into the blood stream.

A solution of epinephrin has been useful in hemorrhage from the mouth and throat. Hanzlik (*J. Exper. Pharm. & Therap.*, 10: 509; 12:71, 1918) has found epinephrin an efficient hemostatic agent. Liquor epinephrin hydrochlorid is applied locally for this purpose. But here local considerations have a profound bearing on the control of hemorrhage.

Epinephrin is sometimes effective in anesthetic accidents and in shock of operation, but for this purpose, it must be injected intravenously, care being taken not to give an overdose. The considerable effects on blood pressure and the heart which may occur require special experience and watchfulness of the patient.

Dosage.—For local anesthesia in dentistry, from 1 to 5 minims of 1:1,000 solution per cubic centimeter is used, or, in substance, 0.00002 to 0.00013 gm. (1/3,500 to 1/500 grain.)

Solution of Epinephrin Hydrochlorid U. S. P., Liquor Epinephrin Hydrochlorid (Liq. Epineph. Hydrochlor.): A solution of epinephrin hydrochlorid about 1 in 1,000. It should be stored in a brown bottle and in a dark place.

Actions and Uses: The same as for epinephrin.

Adrenalin.—A brand of epinephrin-U.S.P., made from the suprarenal gland.

Manufactured by Parke, Davis & Company, Detroit, Mich. U. S. patent 730,175, 730,176, 730,196, 730,197, 730,198 (June 2, 1903; expired); 753,177 (Feb. 23, 1904; expired). U. S. trademark 53,934.

Adrenalin Chloride Solution: A solution containing 1 part of adrenalin chlorid in 1,000 parts of physiologic salt solution, preserved by the addition of 0.5 per cent of chloretone.

Adrenalin and Cocaine Tablets: Each hypodermic tablet contains cocain hydrochlorid 0.01 gm. (1/6 grain), and adrenalin 0.00005 gm. (1/1,300 grain).

Ampoules Adrenalin Chloride Solution 1:1,000, 1 c.c.: A solution of adrenalin chlorid, 1 part, in physiologic solution of sodium chlorid, 1,000 parts, with preservative.

Ampoules Adrenalin Chloride Solution B 2, 1:2,600, 1 c.c.: A solution of adrenalin chlorid, 1 part, in physiologic solution of sodium chlorid, 2,600 parts, without preservative.

Ampoules Adrenalin Chloride Solution B 1, 1:10,000, 1 c.c.: A solution of adrenalin chlorid, 1 part, in physiologic solution of sodium chlorid, 10,000 parts, without preservative.

Adrenalin Tablets: One thousandth gram (3/200 grain) adrenalin, as borate, yielding a 1 in 1,000 solution when dissolved in 15 minims (1 c.c.) of water.

Adrenalin Tablets No. 2: Each contains adrenalin 0.00033 gm. (1/200 grain) as borate, yielding a 1 in 1,000 solution when dissolved in 5 minims of water.

BROMINE COMPOUNDS

BROMURAL. — $(CH_3CH(CH_3)CHBr.CO)HN.CO.NH_2$—2-monobromisovalerylurea, obtained by the interaction of urea with bromisovaleryl bromid.

Actions and Uses.—Bromural acts as a sedative in nervousness, hysteria, irritability and excitement. It is suggested for preparing restless and apprehensive patients for dental operation, and to relieve a postoperative state of nervous reaction. Given before analgesia or anesthesia, it is claimed to shorten the period of induction, to reduce the amount of anesthetic required and to diminish the after-effects. It is claimed to be useful as a mild hypnotic after long sittings and for wakefulness of post dental origin. Bromural is not effective in cases of insomnia

associated with pain or delirium. Its hypnotic action is mild and lasts from three to five hours.

Dosage.—To allay preoperative pain, 5 grains, from fifteen to to thirty minutes before the operation. To allay postoperative discomfort, 5 grains, after the operation. As a soporific, from 10 to 15 grains.

Manufactured by E. Bilhuber, Inc., Jersey City, N. J., by license of the Chemical Foundation, Inc., U. S. patent 914,518 (March 9, 1909; expired). U. S. trademark 61,165.

Bromural Tablets, 5 grains (0.3 gm.).
(For standards of identical purity, see p. 105, N.N.R., 1930.)

SODIUM BICARBONATE

ARM AND HAMMER BRAND OF SODIUM BICARBONATE.—This product has been admitted to A.D.R. as complying with the provisions and specifications of the Council for dentifrices.

The manufacturers have agreed not to use in future advertising any claim that sodium bicarbonate corrects acid mouth; or any claim which cannot be substantiated by adequate scientific evidence.

(See U. S. Pharmacopeia X for descriptions, tests of identity and purity. Arm and Hammer and Cow brands of sodium bicarbonate meet the requirements of the U. S. P. X.)

Manufacturers: Church and Dwight Co., Inc., New York City.
Copyrights 259, 620, July 9, 1929.

USES OF PAIN RELIEVERS IN FIXED PROPORTIONS BY DENTISTS

The following is one of the articles on pharmacology and therapeutics being published by the Council, which has authorized its publication.

SAMUEL M. GORDON, *Secretary*.

Shotgun prescribing is a hangover of the days of irrational and unscientific therapeutics and prescribing. Before the days of scientific therapeutics, complex combinations of drugs were popular. Such shotgun mixtures were based on the lack of appreciation of factors involved in the causes, symptomatology and treatment of disease, and were based on the hope that if one drug did not hit the mark, another would. With the progress of scientific investigation and appreciation of the pharmacodynamic action of drugs, shotgun prescriptions were relegated to the heap of discarded remedies. But some still persist, and nowhere is this polypharmacy more prevalent than in the compounding of drugs known as "pain relievers."

The exploitation of mixtures of analgesics, anodynes and hypnotics, such as acetanilid, acetphenetidin, acetylsalicylic acid, amidopyrin and barbitals in combination with drugs of diverse pharmacologic action such as quinin, caffein, sodium and ammonium bicarbonate, phenolphthalein and others, is a hangover from the days of polypharmacy and before the application of pharmacology to therapeutics. Even more fatal to progress in therapeutics is the prevailing indiscriminate use of these products in fixed proportions, with little or no regard to the individual dosimetric requirements and idiosyncrasies of the patient. The prescriber is thus being reduced

to the level of an unthinking artisan. By the exploitation of such mixtures under fanciful names, the opportunity for the display of individualism in prescribing is removed, with the result that his prescribing art is slowly but surely being destroyed. This is one of the first steps in the decadence of the "healing art."

It was possibly a recognition of these factors which tended to discourage scientific therapeutics that caused the Council on Pharmacy and Chemistry of the American Medical Association some years ago to point out the irrationality and danger of prescribing such mixtures.[1] As a consequence, the exploitation of such mixtures has been transferred with more energy to the dental profession, which until recently has not had the advantages of a clearing house of unbiased information on rational therapeutics.

Thus, the dental profession is being importuned to use these potentially harmful mixtures as "pain relievers" for indefinitely described conditions such as "preoperative and postoperative dental pain." These irrational and unscientific mixtures are generally sold under short and catchy trade names, which, as a rule, are not indicative of the nature of the ingredients. The name is generally such that it readily lends itself to the exploitation of the profession and the public by sharpers, who generally have more wit than scientific knowledge. The dangers of prescribing (if such a term may be used) these mixtures do not end at the chair. The public is made aware of these preparations through this indirect advertising by the dentist, and becomes fertile soil for the further sale of these potentially dangerous preparations, as the patient is given not only the medicine, but also advice for self-medication.

The Council desires to point out to dentists that the method of exploitation of most of these mixtures, parading under fancy names, is such as to make the profession an advertising medium for distribution to the public, a situation which the profession should at all times guard against. Commercial salesmanship should not be confused with true science. The profession can no more condone pseudoscience and surrender its birthright to commercial interests in the matter of drug-prescribing than in matters of diagnosis, control and prevention of diseases.

It is generally admitted that mixtures of acetphenetidin and caffein may be more effective than acetphenetidin alone in relieving "headache." But when such mixtures are prescribed, the dosage of each drug should be regulated to the requirements of the condition of the patient. This regulation is impossible with the fixed doses in which they occur in these unscientific mixtures.

Acetylsalicylic acid, which is frequently compounded with acetphenetidin in such mixtures, has, in the main, similar pharmacologic actions to the latter. Hence, the compounding of two drugs having similar pharmacodynamic action is irrational. This irrationality is more apparent with admixtures of a laxative, such as phenolphthalein with acetphenetidin and acetylsalicylic acid. Ammonium carbonate or sodium bicarbonate, which is also a more or less common addition to such formulas, is added under the false notion that these potentiate the action of the analgesics; but this view has not been supported by adequate investigation.

Acetphenetidin, acetylsalicylic acid, antipyrin, amidopyrin, caffein and phenolphthalein are all active drugs; and, as mentioned before, their doses should be regu-

1. Annual Reports of the Council on Pharmacy and Chemistry, 1918, p. 73.

lated with care to the needs and tolerance of the individual patient. Acetphenetidin should be given in the smallest effective doses, preferably small doses initially (1½ grains), repeated if necessary. If repeated small doses are ineffective, large doses may be no more effective, but may cause undesirable actions. This also applies to acetylsalicylic acid, or aspirin as it is commonly known to the layman.

It is also irrational to administer these drugs in fixed proportions, for the rates of elimination are different; and unless specially compounded, the effect of one drug is apt to last more than is anticipated or required. This should be remembered by those who are in the habit of using combinations of hypnotics and anodynes, a number of which are on the market under names which are noninforming as to their potent ingredients.

The indiscriminate handing out of such mixtures to the public presents a definite menace to the public health for reasons which have been well established by adequate investigation.[2] Thus, unconsciously, the dentist is being maneuvered into a position of leading the public to an alarming degree of self-medication.

The Council, therefore, holds that the indiscriminate use of complex mixtures of potent remedial agents, as described in general above, is inimical to therapeutic progress and therefore to public welfare. It is objectionable because it is impossible accurately to determine the effects which follow the administration of a number of drugs with different reactions; and because the present exploitation of such mixtures tends to discourage careful consideration of the individual needs of patients, without which there can be no rational drug therapy.

Furthermore, the marketing of many of these mixtures in such a way that dentists are made advertising mediums to the public is offensive to the professional sense of dentists. Dentists should hesitate before condoning the use of such mixtures, especially when they have available individual drugs of tested usefulness for the relief of "preoperative and postoperative pain." Some of these drugs listed in the pharmacopeia are acetylsalicylic acid, acetphenetidin, antipyrin, amidopyrin, barbital and phenobarbital. By prescribing these drugs singly and rationally, the practitioner not only benefits his own therapeutic knowledge, but guards against the indiscriminate use of potentially harmful drugs by the public, whose concern should ever be foremost in his mind.

2. U. S. Dept. Agriculture Bull. No. 126, July 3, 1909.

RULES FOR THE USE OF THE SEAL OF THE COUNCIL ON DENTAL THERAPEUTICS

The following rules for the use of the seal of the Council on Dental Therapeutics supersede the statement of the Council regarding the use of the phrase "This product is acceptable to the Council on Dental Therapeutics of the American Dental Association" detailed in the notice appearing in THE JOURNAL, September, 1930, p. 1752.

SAMUEL M. GORDON, *Secretary.*

1. The Seal may be used in advertising, in circulars and on packages after the product has been made acceptable to the Council and after the acceptance has been

announced in THE JOURNAL; or, in special cases, before the acceptance is announced, at the discretion of the Council.

2. The seal is to be used only in conjunction with advertising of claims allowed by the Council.

3. The seal, if it appears on the package, must be the only seal of such character, and must not appear in conjunction with the seal of any other investigative group, unless approval for such display has been obtained from the Council.

4. The seal is to be used without any comment concerning the significance of the seal by advertisers in any of the places mentioned. The Council will not object to a comment indicating that the seal signifies that the composition of the product has been submitted to the Council and that the claims have been found acceptable to the Council.

5. The maximum size of the seal permitted on the package shall be one-half inch in height or diameter.

6. The size of the seal in advertising shall not exceed one and one-half inch in height or diameter, and shall in no case be larger than an illustration of the trade package.

7. Should the product for any reason, become unacceptable, all use of the seal must be discontinued within six months of date of announcement to the manufacturers of action taken by the Council.

Seal which may be used by manufacturers on labels or in advertising of products accepted by the Council.

BUREAU OF DENTAL HEALTH EDUCATION

EFFECTIVE PUBLIC DENTAL CLINICS*

By GUY S. MILBERRY, D.D.S., San Francisco, Calif.

CONSIDERATION of the subject, "Effective Public Dental Clinics," is desirable in that it permits of an analysis of the problem and defines the purposes of such an analysis.

The term "clinic" is used in this country without a clear conception of its true meaning, as are the terms, "dispensary" and "infirmary." The words are not synonymous, although quite generally so used.

"Clinic," from the Greek, *"klinikos,* of a bed, to recline," is defined as "a place where medicine and surgery are taught practically at the bedside or in the presence of patients."

The Mayo Clinic is quite distinct from the hospitals which surround it and are affiliated with it. Practically no bedside teaching is offered at the clinic building and the instruction is limited to interns, since no other undergraduate classes are in residence. Therefore, the designation "clinic" is not wholly in keeping with the academic definition.

"Dispensary," from the Latin, *"dis,* to, and *pendo,* weigh," is defined as "a place where medicines or medical advice is dispensed gratis or at a nominal fee." Within this interpretation of the term, the designation "Rochester Dental Dispensary" is not entirely correct.

"Infirmary," from the Latin words, *"in,* not, and *firmus,* strong," is defined as "a place for the reception or treatment of the sick, a small hospital or an office for treatment." In accordance with this definition, the designation "Forsyth Dental Infirmary" is adequate; and like each of the others, it is a very euphonious phrase.

These three words are used interchangeably by the dental profession when referring to places where dental service is rendered to the public in other than private offices. Almost universal usage justifies a continuance of the term "clinic" when applied to school dental service.

The adjectives add interest to the title. "Dental" is specific; it fully conveys its meaning and is easily understood.

"Public" modifies the purpose only in degree. Any dental office provides service for the public and, with few exceptions, the public is expected to walk in and make arrangements for service. Nearly every dentist does some charity work and many make fee concessions to certain patients. The real distinction, then, between a public dental clinic and a private dental office is based on the ability of the patients to pay for the service rendered. Dental departments in hos-

*Read before the Section on Mouth Hygiene at the Midwinter Clinic of the Chicago Dental Society, Feb. 4, 1931.

pitals or industrial plants may appropriately be called public dental clinics, even though they are privately owned or managed.

"Effective" is the most important adjective in this title, and suggests the theme around which I shall weave my story. The word "efficacious," implying "productive of desired results," as applied to things seems more appropriate; however, the intent of the first word is quite generally understood.

In my opinion, public dental clinics are social institutions in every sense of the word. Primarily, they are intended to serve the needs of the less fortunate members of society and are usually maintained, in part at least, at public expense. The professional aspect of these social institutions is limited to the service rendered and the interest which the profession, individually or collectively, takes in them.

Public dental clinics may be classified as: (1) school; (2) health center; (3) hospital, and (4) industrial. While the equipment and supplies in each are of the same general type and the character of service is much the same, the policies are quite different. Their effectiveness depends largely on the plan of organization.

1. School dental clinics are the most important of this group because they are organized to prevent or inhibit the decay and premature loss of the teeth. The nearer they approach this objective, the more effective they are. Further, they present the best opportunity that we have for the dissemination of information that will aid in achieving this goal; and they constitute the best existing agency for dental health education in America.

The type of service in school dental clinics ranges from simple fillings, extractions and mouth hygiene to the eradication of infectious lesions in a badly diseased mouth with the necessary reparative or replacement service and, occasionally, the correction of oral deformities. When the dental service necessary in school clinics consists of mouth hygiene and the filling of such pits and fissures as may be justified for prophylactic reasons, they will be most effective.

Effectiveness is measurable negatively in direct proportion to the number of teeth that are filled and the number of teeth that are extracted prematurely.

Almost all of the data available in the reports of school or other dental clinics show the total number of fillings, teeth extracted and other operations or the total number of decayed teeth or cavities, without indicating in any way whether there is a gradual decrease in the number of defects as a result of the service or that fewer persons need such service because they are free from dental defects.

The honor roll plan and the 100 per cent sound teeth records, when sustained regularly, as is being done in Iowa under the stimulation of the state dental program, show that defects are being corrected and that school children are less likely to suffer from caries and its sequelae as a result of this activity, but these data do not tell us how near we are approaching our goal.

2. The health center, a modern institution in name, hybrid of ancestry, organized to meet the community needs as viewed by public health officials, health educators and departments of education, is primarily a service clinic. It is usually managed by a member of the medical or public health profession, and the dental clinic constitutes a department within it. It is intended to provide corrective or remedial service for the indigent or for those who occasionally fall within this class. Its efficacy depends largely on policy and management, and since remedial service is most frequently the ob-

jective, it fulfils a small but necessary part in the larger problem with which we are concerned. Efficacy in the giving of dental health instruction here is appreciably low because of the nervous strain the patient undergoes during any operation, whether painful or not, and because of the type of patient who receives treatment at such a clinic. Individual instruction in the proper care of the mouth and teeth requires more time than can justly be given in a public clinic, especially since many of the patients have passed the age when real prevention can be induced.

3. Hospital dental clinics are usually established as an emergency service. The relief of pain, the extraction of teeth, the eradication of infection, the treatment of injuries constitute the major service. The patient is dismissed in tax-supported hospitals as soon as possible. The effectiveness of these clinics depends wholly on the thoroughness and promptness with which this service is rendered.

Little or no replacement service is rendered to the patients in a hospital for the reason that, if they are well-to-do, their own dentist will care for them, and if they are at the other extreme of the social scale, such service, if rendered at all, is at the lowest possible cost.

4. Strangely, the reports from the industrial dental clinics indicate that the mouth hygiene service is their most effective branch. With less discomfort and better appearance to hold the interest and arouse the pride of the individual in himself, it is no wonder that this is so. We all shun dental service to a greater or less degree. There is nothing pleasant about it.

One might, in truth, say that certain of the industrial dental clinics, both here and abroad, are very efficiently conducted because they render the type and quality of service that the patrons desire at a nominal cost, if any, and therefore everyone is satisfied. This does not imply that it is the best type of service the individual could receive. Other factors take precedence over this in determining the effectiveness of the clinic.

These general statements convey my views on public dental clinics and the character of service usually rendered in them. Their effectiveness is a matter of concern not only to the dental profession but also to the benefactors or governments who pay the bills and the individuals who receive the service.

We have been so fully occupied with the question of establishing public dental clinics, because of our faith in them, that we have paid little attention to their efficacy. The time has arrived when we must take stock of our achievements and determine whether we are accomplishing a good work or not and whether the results justify the expenditure of time and money now being made.

Are we certain that the accomplishments as recorded really protray the results we desire? What are our objectives in public dental clinics? What is the base line from which we may start in measuring our work? What are our standards of measurement?

It seems to me that a careful study should be made of each proposed dental clinic to be maintained at public expense before it is launched on the sea of civic strife.

At present, there is no particular uniformity of procedure in inaugurating such projects. The informational plan in Massachusetts, the promotional plan in Pennsylvania and Michigan, the professional plan in Minnesota, the legal plan in Hawaii are all in operation and each state knows little by actual experience about the others. No intensive study of

the results of these plans has been made with a view to determining how many more children have assurance of a sound, healthy dentition throughout life now than when the clinics were started.

Each state has chosen to formulate its own program as it has its divorce laws and automobile regulations. Perhaps we are fortunate in this respect, in that different experiments may produce good results, in part at least, and profiting by these, we may construct a program that will be more effective than any existing now.

I believe that a well-drawn plan of organization can be laid down now, using the county as a unit. Existing programs can be studied in designing such a plan, and while we may not be assured of its efficacy immediately, at least it will serve as a new starting point.

The county is the governmental unit in which we all live and in which we pay taxes. It possesses an interest that touches every inhabitant and is perhaps the most useful as well as the most neglected division in our political life. It is called by Gilbertson "the dark continent of American politics."

For many reasons, it seems the best place for us to study effective or ineffective governance, whether it be a county health service or a single department of it, such as a dental clinic.

For a long time, it has been the custom for this political unit to hold itself responsible for the protection of human life. Witness the sheriff as probably the oldest type of county officer. And on this basis, it has taken on itself the responsibility of caring for the indigent within its borders. Unincorporated villages do not do this, and most small incorporated towns pass the responsibility on to the county.

County officers carry on their activities with little interference or understanding on the part of the people. These officers have no superior authority and are a law unto themselves; hence, they are to do much as they please, regardless of the fact that the county was designed as a political unit in order that the people might control the source of power.

Urban counties, such as Denver, Philadelphia and San Francisco, where city and county geographic limits are identical and where, in some instances, at least, a single set of fiscal officials function, are under better observation and perhaps better control.

Metropolitan counties are probably the most difficult to study, especially if the urban population is very large and the urban limits do not include the entire county area. Often, the remaining section of the county is comparatively sparsely populated, as in the counties where Buffalo, Milwaukee and Cleveland are located.

Having chosen the county as a unit, one should study the population, resources, natural and artificial, public utilities, facilities for and types of transportation, educational and social advantages and climate.

Property values, tax rate, budgets and other fiscal matters are next in order in this question of the study of effectiveness; for, in the last analysis, a public dental clinic maintained at public expense must depend on revenue from the unit in which it is organized, and its maintenance must be a recognized budgetary item, if it is to be successful and permanent.

The administration of a public dental clinic should be as simple, direct, open and inexpensive as the law will allow, those in charge of it bearing in mind that the quality of service should ever be foremost.

It makes no difference whether a public dental clinic is managed by a depart-

ment of health or a department of education or a joint board, if efficiency is what we desire. It is simply a matter of having a competent executive and a capable staff all of whom are able to render a good service and are sufficiently interested to do so. Efficacy can be measured by results, which should approach the desired objective.

Have you ever asked yourselves what this objective shall be? For myself and my children, I desire that each shall carry his full complement of teeth, sound and in a healthy condition, functioning satisfactorily and with comfort until the end of life.

How shall we measure the accomplishments? First, we must establish a baseline. That, I believe, should be the initial examination made when the patient arrives at the clinic for the first time, the younger the better, after the deciduous dentition is complete. The examination should be carefully recorded on the patient's record card or case history, the most important permanent record in every health service institution. This record is more important for the children in a public dental clinic than for adults, because we are endeavoring to help them to retain their teeth throughout life. The service for children should be primarily preventive.

In the instance of public clinics for adults, another type of service enters in, but effectiveness bears the same relation to the objective as it does in a children's clinic, though the same results cannot be attained.

I have found that a simple and effective method of measurement will give a fairly accurate indication of the accomplishments of a dental clinic if the records are carefully kept. One hundred case record cards selected at random from among those of patients who have been in regular attendance for a period of five or more years, on which the original examination together with all subsequent operations are noted, are chosen. From these records, the condition can be determined at the end of this period, and, if necessary, checked in the patient's mouth, if the patient is available.

With a modified Palmer diagram, letters indicating the temporary teeth and numbers indicating the permanent teeth, all of the permanent operations, such as extractions and fillings, are transcribed for each year of the chosen number of years. Teeth missing and mouth hygiene may be recorded if desired, the latter indicating the patient's interest in his own welfare.

The cumulative evidence, as shown by the exfoliation or extraction of the temporary teeth at approximately the normal age and the normal eruption of the permanent teeth, with no evidence of fillings or, by clinical examination, of caries, would indicate that such a patient had benefited by the service rendered.

Good home care and adequate and regular dental service thereafter with a proper diet should insure the attainment of that objective which I am sure we all desire.

If, at the age of maturity, the majority of the permanent teeth are filled, decayed or missing, we may have reason to believe that our public dental clinic has not been effective. Other factors, over which the dental clinic has no control, may be responsible for this condition; but the clinic usually receives the blame, so that it behooves us to analyze our own problem first and then extend our investigation into the fields of home care, cooperation and nutrition, until we are sure of the causes and can be certain of their removal in the attainment of our goal.

AN ANALYSIS OF PENNSYLVANIA'S PROGRAM COVERING TEN YEARS OF DEVELOPMENT*

By C. J. HOLLISTER, D.D.S., Harrisburg, Pa.

THE title of this paper, "An Analysis of Pennsylvania's Dental Program Covering Ten Years of Development," is not entirely correct, since for several years prior to the beginning of the present activities, the Pennsylvania State Dental Society, through the efforts of a few farseeing and public spirited members, were making great efforts toward the development of a practical state-wide program along dental preventive lines. The analysis here presented covers the first organized, definite state-wide action.

METHOD OF PROCEDURE

Early in the year 1920, the commissioner of health of Pennsylvania, at the request of prominent members of the dental profession, obtained a five months' lease of a motorized dental clinic that I had used during the War. He also contracted with me to operate this equipment. In addition to the dentist who, during this five months' period, acted not only as operator but also as chauffer, mechanic, advance agent, propagandist and follow-up representative, two dental hygienists, and portable equipment, were carried.

To digress for the moment: The success of this demonstration is evidenced by the fact that, within two years, every one of the fourteen communities visited during that demonstration had inaugurated a dental health program in their public schools, supported by local tax funds. The demonstration ended July 1, 1920, and Col. Edward Martin, the commissioner of health, with sincere regret, informed us that he did not see how funds could be found to establish a permanent activity of this type; but the public reaction, through many local tuberculosis societies, Red Cross chapters and parent-teacher associations, was so strongly in favor of the service that a supreme effort was made to adjust the budget to allow for the establishment of the present dental division of the state department of health. The medical profession, as represented by subsequent officials in the state department of health, has supported the work of the dental division wholeheartedly, and there is a close cooperative arrangement between the state department of health and the state dental society for the purpose of governing the policy and activities of the dental division.

POLICY ADOPTED BY THE DENTAL DIVISION, STATE DEPARTMENT OF HEALTH, UNDER THE DIRECTION OF THE DENTAL SOCIETY.

In the beginning, it was felt by these men that the state should not attempt a definite state operative program for local communities, but should rather confine its efforts to propaganda intended to in-

*Read before the Section on Mouth Hygiene and Preventive Dentistry at the Seventy-Second Annual Session of the American Dental Association, Denver, Colo., July 22, 1930.

STATISTICAL EVIDENCE OF RESULTS

	Waynesboro: Population, 12,500; No Dental Health Work in Schools; 100 Sixth-Grade Children Examined, Aged 11 to 13	Chambersburg: Population, 15,000; Dental Health Work in Schools; 100 Sixth-Grade Children Examined, Aged 11 to 13
Number clean mouths	9	80
Number fair mouths	49	20
Number dirty mouths	42	...
Use of toothbrush		
Daily	31	80
Occasionally	68	20
Not used	1	...
Condition of gums		
Pink	100	100
Light red	...	...
Dark red	...	...
Occlusion		
Good	100	98
Fair	...	2
Malocclusion (needing treatment)	...	...
Number children visiting dentist for corrective work	38	86
Number first molars filled	88	230
Number first molars extracted	59	14
Number first molars with cavities	204	93
Number first molars with roots	28	19
Total number cavities in all teeth	446	164
Total number roots	44	33

terest local school and health officials in establishing their own programs. To accomplish this, the following plan was adopted:

The chief of the dental division would make contact first with local dentists in a selected community and then, with their aid, offer the school board a two weeks'

STATISTICAL EVIDENCE OF RESULTS (Cont.)

	Lancaster: Population, 60,000; No Dental Health Work in Schools; 100 Sixth-Grade Children Examined, Aged 11 to 13	York: Population, 55,000; Dental Health Work in Schools; 100 Sixth-Grade Children Examined, Aged 11 to 13
Number clean mouths	6	60
Number fair mouths	32	23
Number dirty mouths	62	17
Use of toothbrush		
Daily	17	65
Occasionally	79	35
Not used	4	...
Condition of gums		
Pink	77	95
Light red	21	5
Dark red	...	...
Occlusion		
Good	81	86
Fair	11	12
Malocclusion (needing treatment)	8	2
Number children visiting dentist for corrective work	32	81
Number first molars filled	55	206
Number first molars extracted	43	41
Number first molars with cavities	292	146
Number first molars with roots	58	28
Total number cavities in all teeth	574	255
Total number roots	76	38

demonstration of a dental health addition to their curriculum, via the dental hygienist, at no expense to the local district. The chief of the dental division would take a dental hygienist and portable equipment, to the town, placing her in the school system as though she were a permanent fixture. She then rendered full public school dental hygiene service, that is, prophylaxis for as many children as

	Upper Right	Lower Right
2nd M		
1st M		
2nd B		
1st B		
Ca		
L I		
C I		
	Upper Left	**Lower Left**
C I		
L I		
Ca		
1st B		
2nd B		
1st M		
2nd M		
Totals		

Dental Division, State Department of Health

School.....Grade.....
Name.....
Date of Birth—Year.....Mo.....Day.....
Date of Exam.....
Sex.....Color.....
Height.....Weight.....
Father's birthplace.....
Mother's birthplace.....

Abnormalities in teeth

Mouth clean.....Fair.....Dirty.....
Tooth brush daily.....Occasionally.....
Tooth brush not used.....
Gums pink.....Light red.....Dark red.....
Gingivitis.....
Hypertrophy.....
Abscesses.....
Vincent's infection.....
Stomatitis.....
Abnormalities in soft tissue.....

Occlusion.....Good.....Fair.....
Malocclusion.....
Class.....Div.....
Abnormalities in occlusion.....
Does he need treatment?.....
Will he need treatment?.....

Early illness, what and what age.....
Measles.....When.....
Scarlet fever.....When.....
Chickenpox.....When.....
Diphtheria.....When.....
Have you had T. A. T.....When.....
How many doses.....
Were you Shick tested afterward.....
Result.....How long after.....

Remarks	Recorded by.....
.....	.....
	Examined by Dr.....
.....	.....
	Orthodontist, Dr.....
.....	.....

Examination blank from the Philadelphia Mouth Hygiene Association borrowed for use in survey.

possible and classroom talks on hygiene, both dental and general, and also on nutrition.

During this demonstration, the chief of the dental division appeared before the local dental society, if there was one, local medical society and all other civic organizations possible.

The success of this procedure is evidenced by the fact that, after ten years

of effort, there are more than 250 school districts financially interested in this work. Our opinion in Pennsylvania, as from the start, has been that the dental hygienist is the most practical means by which the greatest good to the greatest number could be accomplished in dental prevention, and the statistical tables presented in this paper are a very tangible justification of that opinion. I presume that many will not agree with our opinion on this subject, in that our plan has not carried a definite public operative program. Again, referring to this table, it conclusively proves that, with proper educational effort, there is definite stimulation to have corrective work done by private dentists.

A well known truism is quoted in support of the foregoing statement: "If you can make people really want a thing, they will find a way to obtain it." I, early in my experience, had an opportunity to prove that statement in one of our towns. After my speech at the local Rotary club luncheon, the leading citizen of the community, a wealthy man, stood up and made the statement, that, while he believed the value of the subject presented by the speaker, because of a long period of financial and industrial depression in that town, it was going to be a question of not making conditions better for the children, but rather of putting bread in their mouths to keep them alive.

My statement in rebuttal was as follows: "It is true that this community has suffered a long period of financial and industrial depression which has caused much distress, but I have been in this community for two weeks, and, with average power of observation, I have noted that, in spite of this local depression, the motion picture theaters, soda fountains and candy kitchens have been doing a good business. This is something the people want. Is it not possible to make them want better health for their children?"

As a result of that meeting a dental hygienist went to work in that town within the next two weeks, paid for the first year by the eight local dentists and the Rotary Club. The next year they petitioned the school board to take it over, and this was done. At the present time, the school patrons would not permit the board to discontinue this phase of school activities.

Early this year, I completed ten years of service in this field and decided to make a comparative survey to justify both the policy and the effort put forth during that period. The plan devised was as follows:

One of the larger cities was selected in which there had been no definite dental health education activities in the schools. Contact was made with the local dental society and their support enlisted, then the school board was requested to grant permission for a diagnostic examination of a selected group of children in the schools. Three sixth-grade rooms were selected by the local superintendent, who was guided only by the request that these sixth-grade rooms not be taken from the best section of town or the worst, but rather that they be a representative cross-section. One hundred children were examined. The same procedure was followed in a community almost identical in size, character of population, etc., wherein, for a period of over six years, a successful dental health educational program had been in operation; which would mean that the children of the sixth grade had had dental health instruction and supervision during their entire school life up to that point. Then, using the same procedure, two smaller towns, which were almost rural in character, were se-

lected, one with a dental health program, which had been in operation over six years, and the other one without a program. The results of these examinations are here presented as statistical evidence of the tangible results derived from the practical and educational contact by the dental hygienist.

The symbols used in marking the blanks used in survey were as follows:

Temporary teeth, #; fissure, noncarious, F; pit, noncarious, P; incipient caries of fissure or pit, C; cavity, less than one-third surface named, C; cavity, more than one-third surface named, C; cavity deep, pulp exposed, C; roots, tooth crownless, R. surfaces: occlusal, o; mesial, m; distal, d; lingual, l; gingival, g. compound cavity, ;. Example: C om, cavity filled, recurrent decay. extracted, X; abrasion, A; erosion, E; hypoplasia, H; unerupted, U; missing, M; devitalized, D; trauma, T.

In commenting on the findings of this survey, I first want to state that I wish it had been possible to have my hearers and readers actually with me during these examinations. If this were possible, the written or spoken word would be absolutely unnecessary to convince you that there is a practical, efficient and economical means of at least making a big beginning in the control of caries.

This analysis has conclusively proved to those in charge of health matters in Pennsylvania that the dental hygienist can be made a powerful factor in improving the public health, both dental and general. With the enormous amount of research that is being done along dental lines in many parts of the world today, I feel that the dental profession is just beginning to realize that we have overlooked a fundamental factor in the control of pathologic mouth conditions and that factor is education of the general public to the importance of proper care of the mouth and teeth, by which we mean a proper diet, personal home care and regular professional attention.

Samuel E. Bernow,[1] of Nashville, Tenn., has covered this subject in a very able manner. The practical application of preventive dentistry has many times been proved, beginning with the notable demonstration headed by Ebersole in Cleveland in 1910, followed by the Rochester and Boston activities and later by the great work done in McDowell County, West Virginia, under the direction of G. T. Epling, as reported in his paper before this Section last year.[2]

These above mentioned activities should be all that is necessary to arouse organized dentistry to its obligation toward humanity to strive to have some of these tried and proved preventive procedures universally applied. The result of Ebersole's experiment in Cleveland, as well as the benefits derived from the activities in Rochester, Boston and McDowell County, West Virginia, where the work is largely based on actual corrections, gives me opportunity, without being radically enthusiastic, of making the point that no matter what method is employed, it is education that must be stressed if real results are to be obtained. In Pennsylvania, a good start has been made, but we fully realize the enormous amount of work yet to be done.

The statistical survey presented in this paper shows that where we have been able to influence school boards, the dental defects problem among their school children can safely be said to be reasonably under control.

1. Bernow, S. E.: Dentistry's Greatest Need.
2. Epling, G. T.: Achievements and Results in West Virginia of Jenkinjones Dental Dispensary and McDowell County Dental Clinic, 17:1360 (July) 1930.

It is time for organized dentistry to recognize its obligation and its opportunity, and to so act that the children of the coming generations will have the benefit of Herbert Hoover's Child's Bill of Rights along dental lines. If organized dentistry does not recognize this situation and make a supreme effort to meet the issue squarely, I state to you that they are, I believe, almost criminally liable.

CURRENT LITERATURE

EXTRACTS AND ABSTRACTS

Diseases Produced and Prevented by Certain Food Constituents: As the teeth are closely related in chemical composition to the bones, it is not surprising that the dietetic conditions which determine the formation of good and bad teeth are similar to those controlling bone formation. (Edward Mellanby, *J. A. M. A.*, Jan. 31, 1931.) Substances tending to produce perfectly calcified and beautiful teeth are milk, egg yolk and cod liver oil, substances rich in vitamin D.; while cereals, in the absence of sufficient vitamin D, produce defectively calcified, dull, discolored, uneven teeth, according to animal experimentation. Unfortunately, the relation of caries to tooth structure cannot be settled by experimentation with dogs, as these animals are practically immune to this disease. The teeth of children in England, while very subject to caries, were regarded as of good structure until certain deciduous teeth were ground down and examined microscopically, when it was discovered that calcification was very defective. The teeth most prone to caries were found to be of the poorest structure. A 10 per cent variation from these findings was deemed important enough to deserve investigation. When artificial attrition of the teeth is produced in dogs, with secondary dentin formation resulting in reaction, the quality of this dentin can be controlled by variations in the diet. In fact, development of secondary dentin can be virtually prevented if vitamin D is withheld, and the diet is composed mostly of oatmeal. Applying these findings, the author says: "Human teeth, when attacked by caries, also respond by producing secondary dentin. It was found, however, that if a well formed tooth became carious, the secondary dentin was either very defective in structure or absent, while a badly formed tooth free from caries, if it had suffered from attrition, contained abundant well formed secondary dentin. Thus, it appeared that a well formed tooth became carious because the dietetic conditions had changed since the tooth was originally formed and so the tooth had lost some resistance to invading organisms. On the other hand, a badly formed tooth became more resistant to caries because dietetic conditions had improved and so raised its resistance." The deduction was that resistance to caries could be altered by changes in the diet. Four groups of children were fed on different diets, one containing much extra fat-soluble vitamins in the form of cod liver oil, eggs, etc.; a second the least amount of foods bearing the fat-soluble vitamin, with oatmeal; the third, little extra fat-soluble vitamin, and the fourth only irradiated ergosterol as an aid to calcification. Results, after eight months, show that initiation and spread of caries can be greatly influenced by diet, four times as much new caries and spread of old caries being observed in the second group as in the first, and the results in the fourth group indicating that the inhibiting action is largely dependent on vitamin D alone. Cereal was not removed from any of the experimental diets, extra oatmeal being added to the diet of the second group. Recent experimentation of Drain and Boyd, who placed diabetic children on a sugar-free diet containing cod liver oil and devoid of cereal, with cessation of active caries, confirming these results with normal cases, is further evidence that caries can be completely controlled by diet alone.

Diet and Dental Caries: The conviction that defective teeth frequently act as foci of infection has served to stimulate further increasing interest in the care of the teeth, and attention is being centered with renewed vigor on the etiology of caries. The disease

has long been known; paleopathologic studies of ancient Egyptian skulls bear evidence to its prevalence among the earliest races. Dental caries is far more common among the more highly civilized races than among peoples living under less favorable or, at least, simpler conditions. However, there is no evidence for believing that caries is an endemic disease or that it is contagious. That general health has a bearing on the appearance of caries is shown by the fact that this disorder frequently is observed after periods of sickness and especially during pregnancy. In view of the many attempts to account for development of dental caries on the basis of either experimental or clinical conditions, the present state of our knowledge of the etiology of this disease is not gratifying. The anatomic situation of the teeth renders an adequate study of dental pathology extremely difficult. Composed in large part of inorganic material, protected with hard enamel, the teeth are apparently chemically inert. Yet it is asserted that caries consists essentially of localized areas of solution of the mineral salts of the tooth. Furthermore, the fact that the teeth are in a moist, nonsterile chamber, subjected to wide ranges of temperature, to atmospheric gases and to contact with various food materials, renders experimental control *in vivo* a remote possibility. Little wonder, therefore, that caries has been variously attributed to such widely different agents as bacterial activity, the reaction and altered composition of the saliva, the influence of the secretions of the endocrine glands and to faulty diet. It is generally accepted that age is a factor in the susceptibility to dental caries, the incidence being highest between the ages of 7 and 20. For this reason, it would appear to be particularly important to secure data on the factors influencing the appearance of this disorder in the young, with a view to developing effective prophylactic measures. This is the thesis on which are based recent extensive studies of Bunting, Hadley, Jay and Hard. In a preliminary survey, it had been observed that the prevalence of caries was much less among children given diets that would be generally regarded as adequate. In the main investigation, the relative influence of antiseptic mouth washes, diet and a combination of these was studied. Five groups of children consisting of from seventy-four to 159 individuals were examined both before and after approximately a year had elapsed, during which time the experimental measures were in effect. Four of the groups lived in state-supported institutions and so might be expected to have been under more of less satisfactory control. The first two groups were provided with a satisfactory diet from which sugar was eliminated, except as it was used to make the food palatable. In this diet, milk, green vegetables and fruit were prominent. In addition to this favorable diet, an antiseptic mouth wash was used daily. At the end of the period of observation, caries was active in 5 per cent and 6 per cent respectively of the children, while 80 per cent and 79 per cent respectively were free from the disorder. In the third group, attending a public school, mouth antisepsis was practiced, but control of the diet was not attempted. After nine months, 50 per cent showed active caries and only 25 per cent were free. The fourth group consisted of children in a state public school and was provided with an "unusually good" though not ideal diet. Here the mouth wash was omitted, and after a year, 75 per cent were normal, while only 6 per cent showed active caries. In the fifth group, in which the ration was not carefully balanced, neither dietary change nor preventive treatment was carried out. Eighteen per cent of these children were free from lesions, while 49 per cent showed active caries. In spite of the fact that studies of large groups of human beings inevitably suffer the drawbacks of noncooperation and lack of suitable controls, the investigation of Bunting and his co-workers is impressive. In the three groups in which milk, fruits and green vegetables were prominent in an otherwise well balanced diet, the progress of caries was either greatly diminished or prevented entirely, and this result was obtained whether antiseptic mouth washes were used or not. It was also pointed out that these children were in excellent general health at the termination of the investigation. In those groups consuming diets not entirely satisfactory according to modern nutritional standards, the disorder was active and its rapid course was not arrested. Among these children, likewise, the use of oral antisepsis exerted little influence. While the observations here discussed have demonstrated little that is new concerning the immediate cause of dental caries, they do emphasize again the impor-

tance of diet in the control or prevention of the disease. At first glance, the beneficial effect of the better rations might be attributed to a metabolic change, in which case one is confronted with the difficulty of explaining a situation in which an apparently inert and inactive structure such as the enamel is so altered chemically that it is rendered in a comparatively short time either more resistant or more susceptible to the effects of substances in the mouth. The other point of view emphasizes the mechanical action of foods such as greens and raw fruits which have been demonstrated to be of value in the prophylaxis and prevention of caries. Regardless of the point of view from which the beneficial effect of adequate diet is considered, it is satisfactory to know that this prevalent disease of childhood and youth can be largely controlled by a procedure at once physiologic and highly beneficial for many other reasons. —Editorial, *J. A. M. A.*, Dec. 20, 1930.

The Pulpless Tooth: Students of the pulpless tooth problem are divided into three classes by J. Staz *(J. M. A. South Africa):* the ultraradical, the ultraconservative and the rationally conservative group. The first group regard the pulpless tooth as a foreign body and a continual menace to the general health. Sterilization by any mode of conservative treatment is looked on as impossible and an artificial substitute is considered preferable to the potentially dangerous natural tooth, which is regarded as dead because it is cut off from sources of nourishment. This view is in direct opposition to that generally accepted, i. e., that a tooth with a healthy periodontal membrane and cementum is not beyond the pale of nutrition, recent research having demonstrated a well-marked system of lymphatics from the alveolus to the dentin via the periodontal membrane and cementum. The ultraconservative group regard the pulp as nonessential to the well-being of the tooth, which they would retain under all circumstances. They do not accept the theory of focal infection or, accepting it, advocate various therapeutic measures for dealing with the pulpless tooth. The tooth is to be saved for its importance as a tooth, regardless of possible systemic results, for esthetics, for the purposes of mastication, to support a partial denture, to prevent possible deformity; all local reasons, except mastication, which influences digestion. The rationally conservative group advocate retention of properly treated pulpless teeth, when there are no pathologic symptoms. Each case is judged on its merits. Root canal work calls for different types of handling: devitalization of a living pulp; treatment of septic teeth, and cleaning and filling of sterile canals. To determine the probable menace of the pulpless tooth in the individual case, three methods have been advocated: (1) inoculations of cultures in saline suspension into the skin; (2) the Solis-Cohen test, calling for the testing of specimens from all the different possible foci of infection in samples of fresh blood taken from the patient; i. e., selective culturing, the bactericidal power of the patient's blood inhibiting the growth of nonpathogenic organisms, and (3) the biologic control method of Gottlieb. In conclusion, the author states that research seems to point to the evolution of improved methods of combating bacterial invasion and treating root canals, placing the average tooth within the limits of savability.

Tooth Aspect of Arthritis: The fact that any type of arthritic complaint may lead to the advice, professional or lay, to have the teeth "x-rayed" and probably the teeth that are supposedly offending extracted, regardless of the possibility that the condition may not be the infectious type of arthritis or even arthritis at all is decried by Kurt H. Thoma *(American Med.,* October, 1930). A clinical examination, often including intricate tests, should augment the roentgen-ray diagnosis, not overlooking the service of the rhinologist. Oral lesions which may be foci of infection the author groups as caries-pulp infection-periapical infection and gingivitis-periodontitis-periodontoclasia. He calls attention to the fact that the vital pulp is not always to be regarded as a normal pulp, and that the diseased pulp may be the most potent source of infection. He advocates extraction of all teeth showing either pulp or periapical infection, although he does not condemn wholesale all pulpless teeth in well persons. He considers it important to pay particular attention to overcoming pyorrhea and gingivitis in persons suffering fom infectious arthritis. Partly erupted teeth he regards as a greater menace than entirely impacted teeth. The extensive bone lesions that sometimes result from infections of the teeth may be important factors in focal infection, and chronic maxillary sinusitis is quite frequently of dental origin. All

foci of infection must be eliminated if lasting improvement in the general physical condition is to be expected. The author has had good results from the elimination of dental infection in acute and subacute inflammations in and about the joints. The observation that frequently the extraction of teeth is followed promptly by an exacerbation of the arthritic symptoms is regarded by him as almost certain proof that there is a close relationship between the focus and the disease of the joint. Some cases result in disappointment, but in these there are probably other and undiscovered foci of infection. In some cases, such as those of an infectious arthritis of long standing, while there may be little improvement, function may be less painful. Extraction of all offending teeth at one time is often dangerous. Gradual extraction at intervals of from three to eight days has a therapeutic value, inducing an effect similar to repeated vaccines. The author advocates the use of autogenous vaccines in certain cases.

Relation of Teeth to Diseases of the Eye: Wilmer *(Arch. Ophthalmol.,* October, 1930) advises that, in many serious ocular lesions, roentgenograms should be taken of all the teeth. Even then, pus pockets or a degenerating pulp in an anomalous root may be overlooked. Crowned, devitalized, badly discolored and pulpless teeth should be under suspicion in patients who have a chronic uveal inflammation. Occasionally, the extraction of badly infected teeth seems to cause for a short time a temporary exacerbation of the ocular inflammation and occasionally serious eye complications have followed. In many cases of serious inflammation of the eye, infected teeth may be associated with other foci of infection, such as in the sinuses and tonsils. In such cases, it is impossible to say just how much the teeth have contributed to the cause of the eye lesion, but their evil influence should be removed. Even when a definite general toxemia exists, as in the case of syphilis and tuberculosis, the patient should be treated for sepsis of the mouth, because the general toxemia seems to sensitize the eye tissues to infection existing in even distant foci. The great preponderance of lesions of the vascular uveal tract resulting from dental sepsis suggests the blood stream as a definite means of transmission of infection to the eye. The ocular lesions from dental sepsis may be the result of a slow and general sensitization of the delicate eye tissues to the diluted or nonvirulent bacteria or their toxic substances rather than a sudden overwhelming infection. The reports of reflex ocular neuroses of dental origin are too numerous to admit of any doubt of their existence. The laboratory proof of pathogenic micro-organisms in the affected eyes of patients suffering from dental sepsis has not been found; but from the hundreds of clinical observations reported, one must believe that infected teeth and many ocular inflammations have a close causal relation. The proper care of the teeth is one of the most important factors in the present-day public health program and in the scheme for the conservation of vision.—Abstr. *J. A. M. A.*

Treatment of Trigeminal Neuralgia: Lux (*Wein. klin. Wchnschr.,* Nov. 20, 1930) first criticizes the generally accepted theory of the etiology of trigeminal neuralgia and the methods of treatment which have been based on this theory. In observing patients during attacks of trigeminal neuralgia, he noted a hyperemia of the skin in the region of the trigeminus and an increased perspiration and tear secretion. The patients tried to counteract their pain by pressing and massaging the painful region. It was also observed that in the intervals between the attacks there was neither hyperalgesia of the skin nor pressure pains. From this, the author concluded that the phenomenon is due to vascular spasms in the region of the ganglion. He hoped to overcome these spastic conditions by diathermy treatment. Experiments on cadavers convinced him that, by applying electrodes to both eyes and to the back of the neck, the entire ganglion and its surroundings could be influenced. When the method was employed on patients, it was found that their eyes were extremely sensitive to pressure. But this difficulty was overcome by padding them with cotton that had been saturated with physiologic solution of sodium chlorid and by using electrodes of wire netting. The treatment was first employed on two patients during an attack, and the results were favorable. During the following five years, the author employed this therapy on about 100 patients. He gives several case reports. The number of treatments necessary differs in each case. In some instances, from five to ten treatments were sufficient; in others, as many as between twenty and forty were needed. The author recommends the further

investigation of this treatment.—Abstr. *J. A. M. A.*

Unilateral Progressive Facial Hemihypertrophy: A case of unilateral progressive facial hemihypertrophy in which reconstructive surgery was employed with satisfactory results is reported by H. L. Updegraff (*Am. J. Surg.*, December, 1930). The patient, a young man, aged 21, had been afflicted from birth. Photographs taken in infancy and early childhood showed a progressive unilateral facial development. There were no other physical abnormalities. The bony as well as the soft structures were involved. The left half of the lips and of the tongue was enlarged. The left upper and lower molars had been removed in an effort to allow the mouth to close and the gums were touching at the posterior portion. The left half of the mandible seemed to slope inward; the left maxilla was markedly displaced toward the center line and the palate was very high. A preliminary face mask and a composite model of the jaw from actual measurements revealed a ridge of bone on the left lower edge of the mandible about 12 cm. in length and from 1 to 15 mm. larger than the right side. A semilunar incision was made from a point 3 cm. posterior to the point of the chin to a point opposite the aural canal. The skin was freed and elevated to the lip border and as far forward as the zygoma. A large amount of hypertrophic fatty tissue interspersed with connective tissue bands was removed from the cheek. The excess bone was sectioned at the lower edge of the mandible with a rotating electric saw and the facial skin brought down and refitted over the face. The new closure entailed the removal of an elliptical strip of skin about 15 cm. in length and 4 cm. at its greatest width. There was healing by first intention. The parotid was enlarged and the intraoral opening of Stenson's duct was somewhat forward and lower than ordinary. The left mental foramen of the mandible instead of being opposite the first and second lower bicuspids appeared at the point opposite and below the second molar. The dental canal was represented by a groove running along the usual bed of the canal and lying in it, the mandibular dental branch (which was of necessity sectioned) measuring 5 mm. in diameter. Three months later, the exostosis of the incisor area was removed intraorally and a portion of the upper lip resected. The necessary upper and lower plates were then constructed. There has been some recurrence of the fatty deposit, but none of the bony growth.

Treatment of Trigeminal Neuralgia: A new method of dealing with trigeminal neuralgia is suggested by Dr. Nasaroff in *Deutsche Zeitschrift für Chirurgie.* The method consists in applying an 80 per cent solution of ethyl alcohol to the common carotid artery and the lower portions of the internal and external carotids, until the arteries are thoroughly moistened with the drug. The method has been employed in thirty cases, and some improvement was obtained in every case, though the extent of the improvement and the time that it took to take effect varied in different cases. The author is of the opinion that this method should be used in preference to alcohol injections and to radical operative measures. It is true that the radical operations for the removal of the whole or part of the gasserian ganglion, or for the division of the sensory root on the cranial site of the ganglion, are very drastic measures, requiring great technical skill and anatomic knowledge on the part of the surgeon, and involving considerable risk to the patient. Such operations, therefore, are naturally to be avoided whenever possible, and any alternative method that will give relief will be welcomed. It is difficult, however, to understand the reason why relief of trigeminal neuralgia should be obtained by painting the carotid artery with alcohol or any other fluid. This relief cannot be obtained through the circulation, nor from any effect upon the arterial wall. There is, of course, a sympathetic nerve plexus ramifying on the walls of the artery, and it may be that it is by this means that the effect is produced, but even this does not seem an obvious explanation.—*Dent. Surgeon,* Jan. 17, 1931.

The Scientific Spirit: Have you ever stopped to think what it means when a man acquires the scientific spirit? It means that he is ready to let things be what they may be, whether or not he wants them to be that way. It means that he has conquered his desire to have the world justify his prejudices. It means that he has learned how to live without the support of any creed, that he can be happy, or at least serene, that he can be good, or at least humane, no matter what conclusion men may come to as to the origin of the world, or its plan, or its destiny. There are not many men of this sort in any age.—Walter Lippman.

MISCELLANY

BOOK REVIEWS

Encyclopedia of Dentistry. Edited by Alfred Kantorowicz, Professor of Dentistry, Director of the Dental Institute of the University of Bonn (Germany), Director of the Public School Dental Clinic of the City of Bonn, in collaboration with numerous authorities. Vol. II G-K, with 806 illustrations; Vol. III L-R, with 1,220 illustrations. Published by Johann Ambrosius Barth, Leipsic, and Hermann Meusser, Berlin, 1930; 1931.

In the review of Volume I of this prodigious work (THE JOURNAL, March, 1930, p. 552), an idea of the general arrangement of this encyclopedia was given. Since that time, two more volumes have appeared, which leaves only one volume to complete the series. This encyclopedia is the most extensive survey of modern dentistry ever published, covering all phases both of dentistry and of its related sciences.

The phrase "most extensive survey" is not an overstatement. One point particularly evident even to the casual reader is the careful study of foreign bibliography revealed in the work of each collaborator. The American contributions especially are considered and brought in correlation with the work done in each field in Germany and other countries. Consequently, this encyclopedia has an international note which is unfortunately still lacking in most American writings and textbooks. It likewise shows the extensive knowledge that a well-informed dentist must have, including research done in countries other than his own, if he is to consider himself up-to-date.

The importance of some items included in the work is such that one is not surprised to find that some contributions have developed into actual monographs. The content of some of the more important chapters is as follows:

Galvanism: The physics and chemistry of galvanism, general, as well as applied to the field of dentistry, are covered.

Gangrene: This chapter, written by Professor Hess, of Zurich, one of the outstanding students of the question of root canal treatment, gives consideration to the clinical side of this problem and an extensive discussion of the work done by Callahan, Buckley, Howe and Prinz, with roentgenograms and histologic specimens, diagnosis and therapy.

Plastic surgery of the face: This chapter together with those on plastic surgery of the jaws and prosthesis of the jaw is written by Bruhn and Lindemann from the West German Oral Surgery Clinic, where during and after the war thousands of the worst mutilations of the face and jaws were treated and restorations made. All possible destructions of the tissues of the face and their surgical and prosthetic restoration are illustrated by typical cases, with photographs of patients, models and roentgenograms.

Caries: Here, as throughout the entire work, one is aware of the great advantage of having one man (in this instance, Türkheim) give an unbiased report on the knowledge, opinions and findings of all the workers in his particular field. By this method, the reader, who would be unable to collect all this information himself, can find everything of interest to him in a short, comprehensive article. The chapter on caries is subdivided under the following topics: congenital resistance (formation, structure, calcification, metabolism); injuries (bacteria); chemism (carbohydrates, saliva); clinical and histologic manifestations of the progress of caries; statistics; prophylaxis.

Health insurance clinics: This chapter is particularly interesting at the present time when the problem of health insurance dentistry becomes more and more vital in the United States. The history and progress of the dental health insurance clinics are described, their influence on the quality of dental work, the relationship between free practice and the clinic, and the relationship between employer, employee and clinic. This subject is continued under "health insurance," concerning the most important laws and regulations for health insurance, exact data about materials used, payments, fees, salaries, etc.

Constitution: This gives the dentist a glimpse into the newest achievements of medical and psychologic research; the various constitutional types and the relation between constitution and mind, and, finally, the relationship between constitutional types and teeth.

It is deemed unnecessary to mention that the dental subjects customarily found in textbooks, such as inlays, jacket crowns and crowns, are adequately described. Rather, it is the intention to emphasize in this review merely those points ordinarily not found in books on dentistry.

Volume III, with almost 1,100 pages and more than 1,200 illustrations, contains among other subjects:

Light: Its physical and therapeutic qualities.

Oral cavity: The illustrations for this, as well as for many other anatomic subjects, were taken from the book, "Anatomy for Dentists," by Sicher and Tandler. These are excellent anatomic drawings.

Narcosis and Narcotics: This chapter gives the history and development of narcosis; indications for narcosis; preparation of the patient; instruments, and technic of narcosis. Of especial interest are the tables giving the presence of the narcotics in the blood in percentages, in relation to the reflexes, respiration and heart action.

Nose: Diseases of the nose, inflammations and injuries are covered in their relation to dentistry.

Pyorrhea: This chapter is written by Häupl. For the most part, he considers inflammation in the etiology of this condition and does not enter very much into the other factors involved in this problem.

Diseases of the pulp: The author of this chapter is Rebel, whose familiarity with all phases of pulp conditions and pulp therapy is extraordinary. One hundred and thirty pages are devoted to normal and pathologic histology of the pulp; pulp anesthesia; histologic changes following devitalization of the pulp, in human as well as in animal material; methods of treatment of the diseased pulp; pulp capping; amputation, and mummification.

Under R are found:

Radium: The physics and therapeutic use, including the modern methods of radium application ("seeds").

Races, racial characteristics: Development of the human race; race types; teeth and race in their relations.

Roentgenology: A very comprehensive outline of general and dental roentgenology, with more than 200 illustrations referring to x-ray apparatus, angulation and oral and dental diagnosis.

In summarizing, one must admit that these books well deserve the name encyclopedia. They cover not only the dental field in the stricter sense, but also practically everything that might interest the dentist, whether chemistry, law, metallurgy or equipment, or any medical or scientific question related to dentistry.

The price of the work ($20 for Vol. II, $22 for Vol. III) is reasonable in consideration of its great value.

RUDOLF KRONFELD, Chicago.

Diet and the Teeth—an Experimental Study. By May Mellanby, issued by the Medical Research Council. Part II of Report, Concerned with A Diet and Dental Disease and B Diet and Dental Structure in Mammals Other Than the Dog. Illustrated with 28 plates; price 2s. 6d net. Published by His Majesty's Stationery Office, London, England.

This is a report of ninety-three pages, the second of a series of three which will embody Mrs. Mellanby's studies of the relation between diet and the teeth. Part I has already appeared and Part III may be looked for later. The whole will constitute a not only comprehensive study of the subject as it relates to animals, but in Part III it is also intended to take up the study of the human teeth.

In addition to the study of dogs, this volume treats of such animals as rats, rabbits, monkeys, etc., and it is merely a further elucidation of the author's well known theories on the subject. Mrs. Mellanby is a most thorough investigator, and when the whole series appear, they will furnish a real contribution to science. We shall watch with particular interest for the final volume on the structure of human teeth which will bring the work to a more intimate issue for the rank and file of the profession.

PUBLIC WARNED REGARDING EXAGGERATED CLAIMS FOR "PYORRHEA CURES"

"People who suffer from pyorrhea, trench mouth, bleeding, spongy or receding gums

or similar mouth disorders should know that the Federal food and drugs act confers no jurisdiction over advertised claims made by manufacturers of tooth pastes, powders, dentifrices, and mouth washes, now on the markets, that their products will cure these ailments," says J. J. Durrett, M.D., chief of drug control, Federal Food and Drug Administration. "But the act does control statements made on labels or in printed circulars accompanying these products."

"The Administration," Dr. Durrett explains, "does not recommend any particular drug for any purpose, but it is charged with seeing that drugs entering into interstate commerce are lawfully labeled and represented under the Federal food and drugs act. That law states that a drug or medicine is misbranded if its package, box, bottle or accompanying circular contains any statement as to curative or remedial power which that preparation does not possess." In a survey of the dentifrice field, now under way, government officials have found and seized scores of products so mislabeled. "The food and drugs act," says Dr. Durrett, "does not have jurisdiction over curative claims made in magazine, newspaper, billboard or radio advertising."

Several manufacturers of dentifrices claim that their products have curative value for pyorrhea and similar oral ailments. "According to competent dental surgeons, however, no tooth paste nor mouth wash is capable of curing pyorrhea," Dr. Durrett declares. "This disease centers deeply in the gums and no surface antiseptic, used as a gargle, wash or spray, or brushed on the teeth, can reach the germs that cause it. Sufferers from this, and similar mouth diseases, should not rely on washes, gargles, powders, or tooth pastes.

"Some manufacturers assert that their mouth washes and dentifrices kill certain numbers of bacteria in a given time," Dr. Durrett comments, "but manufacturers making these claims do not explain that experiments with the antiseptic materials were carried out in the test tube and not in the mouth, and they also fail to state that the conditions in the mouth are not at all similar to those in the laboratory test tube. When one puts foreign material into the mouth, there is an immediate stimulation of the salivary glands. Any antiseptic taken into the mouth would immediately be diluted with mouth secretions, thus making dissimilar the conditions of mouth tests and test-tube tests. In spite of the claims of certain manufacturers that 'a considerable variety of germicides which will destroy in the mouth every organism with which they come in contact are known at the present time,' the prospective buyer should remember that there is no antiseptic nor dentifrice known to science at the present time that could be expected to reach the deeply seated organisms which cause pyorrhea and related mouth ailments."—U. S. Dept. Agriculture.

EXCERPTS FROM THE ANNUAL REPORT OF THE SURGEON GENERAL, U. S. ARMY, 1930

DENTAL DIVISION

Organization — Surgeon General's Office: The dental division has functioned with the same organization as during the preceding year. The commissioned officer personnel consists of a chief of the division and an assistant. Continued careful supervision of the dental service by dental officers has resulted in maintaining this service at a high degree of efficiency and in providing dental attention to the Army with the dental personnel available. The dental service has cooperated with the United States Bureau of Standards and the American Dental Association during the year in research work, with a view to developing better filling and denture materials and better technique in the use of these materials. In cooperation with the supply division of the Surgeon General's office, a careful study has been made covering proposed changes in dental items of the supply table in connection with the pending reprint of this table. Considerable of the present dental equipment in use at general hospitals and in the field at large was purchased during and preceding the World War and has seen continuous use since that time. In order to keep abreast of the general advancement of dentistry and its newer and improved accepted methods of treatment, it becomes necessary from time to time to delete certain equipment from the supply table, substituting for such obsolete equipment more modern items of supply. This is the object sought in the pending changes. Manufacturers of dental equipment and surgical supply houses have cooperated in this endeavor to a high degree, furnishing for tests in certain instances without cost to the Government items of equipment specially manufactured for the purpose of clinical testing, with a

view to determining their superiority for use in the military service. The building up of an efficient Dental Corps Reserve has, in cooperation with the reserve section of this office, continued throughout the year. The military committees of the various state dental societies appointed by those societies at the suggestion of the Surgeon General have continued to function and furnish the War Department with valuable information relative to the general fitness and professional qualifications of candidates for appointment in the reserve. At the end of the fiscal year 1930, the Dental Corps Reserve had a total of 4,688 commissioned officers, of which 4,641 were white and forty-seven were colored. The distribution in grades was as follows: colonels, six; lieutenant colonels, forty-three; majors, 351; captains, 943; first lieutenants, 3,345. There were 477 new appointments made in the Dental Corps Reserve during the year and 451 who were not reappointed, resulting in a net gain of twenty-six.

Corps Areas and Departments: In the several corps areas and departments, dental advisors have, as in the past, cooperated with their respective surgeons and with the Surgeon General's office in the administration of matters pertaining to the dental service. Increased efficiency of the dental service has steadily followed increased supervision of the dental service by dental officers. Wherever such supervision can be further increased by the action of corps area and department surgeons, it is believed that further increases in efficiency will be found to result.

PERSONNEL

Commissioned: At the beginning of the fiscal year, the Dental Corps had three vacancies which were filled during the month of July, thus bringing the corps to its full quota of 158 officers. During the year, six officers were separated from the service, two by resignation, one by retirement for physical disability, one by discharge and two by death. An examination for appointment in this branch of the service was held in April, 1929, and as a result eight candidates were found qualified. All of these were appointed during the fiscal year to fill vacancies as they occurred. An additional dental reserve officer was called to extended active duty during the year under authority granted in connection with the care of Veterans' Bureau patients at Army hospitals, making a total of ten officers in this group, all of whom have been rendering faithful service. Fourteen officers of the Dental Corps were assigned to administrative, supply and training duties, eight of whom were instructors with Reserve Officers' Training Corps units at an equal number of outstanding dental colleges in the United States. Eight officers were on duty as students at the Army Dental School and eight at the Medical Field Service School during nine months of the year, which left, after subtracting these, but 135 dental officers actually engaged throughout the year in rendering professional service to the Army. The existing inadequate dental personnel is constantly being brought to the attention of this office by medical officers in their sanitary reports, in which it is frequently recommended that a substantial increase of dental officers be authorized for outlying stations. Similar recommendations have been made during the year by officers of the Inspector General's Department who have come in intimate contact with the dental situation in connection with their prescribed annual inspections of military posts, stations and hospitals.

Enlisted: The present allotment of enlisted men for the dental service is six staff sergeants, twelve sergeants, two corporals, eighty-five privates first class and eighty-five privates. The allotment of specialists ratings is two, first class; eight, second class; four, third class; seventeen, fourth class; seven, fifth class, and sixty-five, sixth class. The Army Dental School has for several years provided instruction in dental hygiene and dental mechanics to selected enlisted men of the Medical Department. The past year, because of an insufficient number of applicants for the course, no class for dental hygienists was conducted. The regular course of instruction in mechanics was given to ten enlisted men, who upon graduation were sent to various stations in the United States and foreign possessions to aid in increasing the efficiency of the dental service of these stations.

INSTRUCTIONS AND TRAINING

Civil Institutions: Because of the rapid strides that dentistry is making, dental colleges and dental societies have felt impelled to offer to graduates of dentistry postgraduate courses of instruction in the various dental subjects. Because of the shortage of commissioned personnel, it has been impracticable to send officers to any of these institutions

to pursue any extended postgraduate courses. One officer, in addition to his regular duties, found it possible to avail himself of the opportunity of attending a scientific course of instruction of several months at Georgetown University Medical School of this city, while several others were afforded the opportunity of attending brief postgraduate courses conducted by civilian specialists and by dental societies offering such courses. In addition, local dental societies throughout the country have cooperated to a high degree by inviting local representatives of the Army Dental Corps to participate in their meetings and clinics.

Army Dental School: Eight officers successfully completed the ninth basic course of instruction at the Army Dental School during the year, one officer receiving the Dental Corps medal for the highest scholastic standing in his class. The third annual advanced course of instruction was conducted during the year and one officer was detailed to take and successfully completed this course. During the fifth year of instruction of enlisted men as technicians in dental mechanics ten enlisted men completed the course and were awarded certificates of proficiency in that specialty.

Medical Field Service School: Eight officers attended the basic course of instruction at the Medical Field Service School. Of this number, seven successfully completed the course. One officer, because of sickness, was unable to attend the full course.

Reserve Officers' Training Corps: Eight Reserve Officers' Training Corps units were continued at an equal number of the leading dental schools in the United States, with an officer of the Dental Corps serving as professor or assistant professor of military science and tactics at each institution. There were enrolled in these units a total of 883 students, all classes. One hundred and fifty-nine graduates were commissioned in the Dental Corps Reserve.

PROFESSIONAL SERVICE

Commissioned, enlisted and civilian personnel of the Dental Service have shown a commendable spirit of earnestness and zeal in maintaining their service at a high degree of efficiency throughout the year. A study of the data presented herewith shows that a large amount of professional service has again been accomplished during the past year. Increases are noted in the number of persons treated, sittings, temporary fillings, extractions, fractures of the mandible treated, crowns repaired, bridges and dentures constructed and dentures repaired, while a decrease is noted in the number of permanent fillings, root fillings, prophylaxis cases, fractures of the maxillae treated, bridges repaired and crowns constructed. In this comparison, the less frequent dental operations have been disregarded. As compared with the preceding year, there was a decrease of 278 in the number of operating days. The reduction in the number of root fillings, together with the increase in the number of extractions, indicates a continued trend toward the prevention and eradication of chronic dental infections in the general campaign that is being waged against the further progress of the degenerative diseases of the human system. In a limited number of places, the services of specially trained oral hygienists have been available. For this service, a few graduate civilian hygienists have been employed together with a small group of enlisted men of the Medical Department specially trained at the Army Dental School or locally trained by the dental officer with whom assigned to duty. An increase of service of this kind is urgently needed because of the highly valuable aid of such service in the prevention and control of pyorrhea, dental caries and their more serious sequelae. Here, however, as in its other efforts to furnish the required dental attendance for the Army, the Dental Service has been seriously handicapped by inadequate personnel. Each year for a number of years recommendation has been made for a substantial increase in personnel for this service and such recommendation is again earnestly renewed.

CORRESPONDENCE

"The Writings and Activities of Dr. Alfred Owre in Relation to the Status of Dentistry"

To the Editor: Since reading Dr. B. B. Palmer's article in the March number of The Journal, I have been postponing this letter until I should be cool enough to write in restrained language.

It astonishes me that The Journal should lend itself to the publication of such a foul attack, without careful verification of its truth. To permit publication of quotations of a man's words *in part,* eliminating context and objectives, and reading into them interpretations obviously twisted, inaccurate and

motivated by personal spleen, is a serious matter. To assume to interpret a man's motives, and to couple such interpretations with libelous innuendo, is again a serious matter.

In several instances, where Dr. Palmer speaks of things of which I have personal knowledge, he has committed himself to statements and interpretations which I know to be wrong. In one instance, of which he has made great point, I have the direct statement of two of the ablest and most respected deans in the country, who were present on the occasion described, that Dr. Palmer's statements concerning it are not true. With the thirty day start you have given that statement, it can never be overtaken, and will continue to confuse and injure the cause of dental education for a decade or more.

The effect of Dr. Palmer's article on Dean Owre and the Columbia Dental School is negligible, but the injury done the cause of dental education and dental journalism by the introducing of personal rancor, innuendo and unfair practices is of great importance.

Dr. Palmer and others seem to be engaged in an organized campaign to whip up emotionalism against Dean Owre and against policies they falsely charge him with advocating.

I am sorry you failed to verify his statements before publishing them.

HENRY W. GILLETT
140 W. 57th St.
March 11, 1931. New York City.

HOW CAN THE MEMBERSHIP OF THE AMERICAN DENTAL ASSOCIATION BE INCREASED?

To the Editor: The logical answer to the question "How can the membership of the American Dental Association be increased" is: Make our meetings more attractive. Many nonmembers who do not appreciate what it means to be a member of our association help to defray expenses, at least of our large meetings. They buy dental supplies, and since the dental trade association pays for the space occupied at the meetings, this expense is added to the cost of dental supplies.

Dental societies can be likened to churches in that their object is to do good, and a sign on a church "for members only" would receive severe criticism. Why not try out one open-day in the course of meetings of state societies this year, and invite every ethical dentist? Each member of the society could be put on the reception committee, and the day made pleasant and profitable for the prospective members. The invitations, for obvious reasons, should come directly from the president of the state society, rather than from the district or city officer.

Committees which represent state societies do not receive the attention they should when they appear before state legislators, in favor of enactment of certain dental laws, for they do not represent the majority of dentists in their respective states.

Dr. Robert Todd Oliver, the President of the American Dental Association, has as his slogan, "More dentists for organized dentistry," and since we are hearing so much about panel medicine and dentistry, such a slogan is timely, and any ideas that will increase our membership and augment our position should be widely disseminated.

We must not forget that the state, through its board of dental examiners, does not distinguish between members and nonmembers, nor even between ethical and unethical members. Similar certificates are issued to all; and these must be displayed conspicuously, or, in other words, where patients can see them.

It is obvious that one cannot distinguish by means of such registration certificates between the dentist who takes advantage of the opportunities offered to better his dental service through membership in the American Dental Association, and those who do not. Intelligent laymen know the limited significance of the certificate to practice and would welcome further evidence of a dentist's standing, such as the membership the association gives. If nonmember dentists could be made to realize this, more might be eager to obtain membership.

BOYD S. GARDNER,
Rochester, Minn.

A REPORT ON POSTIZO GOLD

To the Editor: An alloy known as Postizo gold is advertised rather extensively in the dental literature. A sample of this material was purchased from the Postizo Gold Company, Chicago, Ill., and the following data are given for the information of the profession.

The chemical composition of the alloy was found to be as follows: copper, 86.9 per cent (by weight); aluminum, 9.8 per cent; tin, 2.0 per cent; nickel, 1.3 per cent. The material may be classified as an aluminum bronze.

This alloy was received in a box plainly marked "1 oz. Gold." The price was $5 an ounce. The sample which we analyzed contained no gold and is therefore definitely misbranded. *The Brass World,* January, 1931, indicates that the current price for ingots of aluminum bronze materials of this type is from 19 to 22 cents a pound.

If members of the dental profession have real need for technic metals of this type, they may find it more economical to purchase their bronze and flux from their local foundryman.

N. O. TAYLOR, Research Associate,
American Dental Association,
Bureau of Standards,
Washington, D. C.

March 4, 1931.

"ODORS"

To the Editor: In the February number of THE JOURNAL I read with interest your editorial, "Odors."

It may be of interest to your readers to learn of a method of obliterating all odors and keeping the office sweet and fresh. I have been using it for many years and many patients have remarked about it.

Here is the formula: Get a wide-mouthed candy jar such as you see in candy stores, capacity 1 quart. Then procure from your druggist one pound of ammonium carbonate cubes. Place them in the jar and then fill with alcohol. Add an ounce of oil of lavender. When the jar is left open, the evaporation of the ammonia to which is added the scent of lavender will keep the room sweet and the air pure. This is particularly effective in an inside reception room.

PIERRE M. WILLEMIN,
1540 San Pablo Ave.,
Oakland, Calif.

Feb. 16, 1931.

NEWS

Annual Meeting of the American Public Health Association: The American Public Health Association announces its sixtieth annual meeting, September 14-17, in Montreal, Quebec, with the Windsor Hotel as headquarters.

The Association has not held a meeting in Canada since 1908 and public health workers from the Dominion and from the United States are invited to take advantage of this opportunity for closer contact. The program is being planned with the progress and needs of both countries in mind. Such subjects as toxoid immunization; rural sanitation, particularly the organization of a practical program for county health units; health education for a large city, for a small city and for a rural community, camp and resort sanitation, including fungus skin infections, particularly those transmitted in swimming pools, and general sanitation of auto camps, have been considered so important by the program committee that special sessions will be devoted to them. Each section of the Association will arrange individual programs, covering public health administration, laboratory research, vital statistics, public health engineering, food, drugs and nutrition, child hygiene, public health nursing, health education, epidemiology and industrial hygiene. Meetings of four other organizations, the American Association of School Physicians, Conference of State Sanitary Engineers, International Society of Medical Officers of Health and the International Association of Dairy and Milk Inspectors, will take place during or immediately preceding the sessions of the American Public Health Association in Montreal. For further information, address the American Public Health Association, 450 Seventh Avenue, New York City.

Dental Service at National Leper Home, Carville, La.: Dental service continues with an increase of treatments rendered owing to increase of patients admitted to the hospital. A gradual decrease in the percentage of oral ulcers and pyorrhea alveolaris has been observed. In two patients recently admitted, sections were made of gum tissue labially of incisors, which revealed the presence of organisms morphologically resembling Hansen's bacillus. Dental service has consisted principally of full and partial denture constructions, extractions, miscellaneous treatments, crown and bridgework, prophylaxis, and, in a small percentage of patients, postoperative treatments.

Pioneers in Free Dental Service Movement Honored: A tablet bearing the inscription "This tablet is erected by the Rochester Dental Society in Memory of Captain Henry Lomb and Dr. William Belcher, who rendered conspicuous service in the establishment of the Rochester Dental Dispensary and the first children's dental clinic in the United States. February 22, 1905" was unveiled on the twenty-sixth anniversary of the establishment

of dental health service in Rochester. The memorial tablet has been placed on the wall just inside the door of the infirmary in the Rochester Dental Dispensary. Captain Lomb provided the first funds for starting the original free dental hospital sponsored by the Rochester Dental Society. Dr. Belcher was a leader of the dental society group which supported and developed the work. More than eighty dentists attended the dinner and unveiling ceremonies, eleven of the forty-eight dentists who were members of the Rochester Dental Society when the movement was started, being present.

Dr. Ottolengui Receives Callahan Award: At the sixty-fifth annual meeting of the Ohio State Dental Society, at Columbus, Rodrigues Ottolengui was named as recipient of the 1930 John R. Callahan Memorial Award medal, in recognition of his work in the field of dental research. To date, the recipients of the medal have been: J. Leon Williams, Frederick B. Noyes, Clarence J. Grieves, Edward C. Rosenow, Percy R. Howe, Howard R. Raper, William J. Gies and Russell W. Bunting.

Deaths

Colvin, James A., Charlottesville, Va.; Baltimore College of Dental Surgery, 1879; died, November 26; aged 75.

French, E. J., Lawrenceburg, Ind.; Cincinnati Dental College; 1893; died, January 7.

Gamble, C. B., Leesburg, Fla.; Atlanta Southern Dental College, 1905; was killed February 16, by a "hit and run" motorist.

Giguette, Frank A., Pasadena, Calif.; University of California, College of Dentistry, 1905; died, December 24; aged 47.

Hardwicke, Wallace W., Indianapolis, Ind.; Indiana University School of Dentistry, 1905; died December 1; aged 50.

Leedham, Harry L., Clinton, Iowa; State University of Iowa, College of Dentistry, 1917; died December 22, after an operation.

Pond, Virgil C., Brookline, Mass.; Harvard University Dental School, 1880; died in January.

Rideout, Jesse L., Danville, Ill.; Indiana University School of Dentistry, 1897; died January 10; aged 57.

Ruyl, James Peter, Brooklyn, N. Y.; New York College of Dentistry, 1894; died December 29; aged 57.

Smith, Mark C., Waterloo, Iowa; State University of Iowa, College of Dentistry, 1915; died December 25, of pneumonia.

Webb, John E., McGregor, Iowa; State University of Iowa, College of Dentistry, 1898; died January 1.

ASSOCIATION NEWS

COUNCIL ON DENTAL THERAPEUTICS

At the meeting of the Council on Dental Therapeutics, January 31, Harold S. Smith was elected chairman of the Council, and Paul J. Hanzlik, vice chairman.

The Council discussed a number of problems relating to its work. The control of advertising in the pages of the official journal in the matter of proprietaries or dental medicinals was discussed. The feeling of the Council was that editors of lay magazines cannot be expected to be guided in the acceptance of dentifrice advertising unless advertising in the official journal was of such a nature as to set the standard for lay editors to follow. The position of the Council was that no advertising copy of proprietaries or dental medicaments should be advertised in The Journal until the copy has been submitted to the Council for approval on the basis of the authority invested in the Council by the Board of Trustees. (See editorial, "The Association and Drug Reform," March, 1930.)

Accepted Dental Remedies

The Council discussed in detail the preparation and the scope of A. D. R., which is now actively under way. The committee of the Council charged with the compilation of A. D. R. was instructed that the book should not be overloaded with medicinal products which are unessential modifications of well used drugs. It was the consensus of opinion that systemic medication, where advisable, should be included in A. D. R. The matter of the recent exploitation to physicians of certain barbital derivatives for induction of anesthesia by the intravenous route was brought to the attention of the Council. The Council

considered the problem and felt that, in view of the great dangers involved in intravenous injection of medicinal products, it could not condone this sort of medication except in the gravest emergency, but that reference to such methods in emergency treatment be made in A. D. R. A member of the Council was instructed to prepare a report on intravenous medication for the consideration of the Council and subsequent publication to the profession.

SEAL FOR ACCEPTED PRODUCTS

A seal that may be used in conjunction with accepted dental products and rules for the use of the seal were adopted. The seal appears elsewhere in this issue of THE JOURNAL.

THERAPEUTIC INVESTIGATION

The Council recognizes the necessity for replacing opinion by fact as a basis for the consideration of the usefulness of therapeutic agents and dentifrices. In order to encourage this as far as possible, a small portion of the Council's funds was allotted for this purpose, and properly qualified investigators were invited to apply to the Council for aid on problems of interest to dental therapeutics. A number of requests were considered and the Council awarded $200 each to Chauncey Leake, professor of pharmacology, University of California, for aid in the investigation of the prolongation of local anesthetic action, and to Hermann Prinz, University of Pennsylvania Dental School, for aid in an investigation of the various therapeutic agents employed in the treatment of hypersensitive dentin. Other investigations being carried out by members of the Council on behalf of the Council, either in the laboratory or the library, were discussed.

PLASTIC AND FILLING MATERIALS ADVERTISED AS GERMICIDES

The Council's attention was called to the circumstance that very little evidence of an adequate nature appeared for the germicidal claims made in connection with cement filling material. A member of the Council was requested to prepare a report on the subject for the consideration of the Council, and, possibly, subsequent publication to the profession.

MOUTH WASHES

The control of mouth wash advertising is as difficult as the control of dentifrice advertising. The Council adopted a ruling that mouth washes submitted or examined for inclusion in A. D. R. be governed under the provisions applying to dentifrices.

YOUR NEW HOME

Your new home at 212 East Superior Street is being put in readiness for occupancy and we expect to move about April 15.

A. D. A. GROUP INSURANCE

Additional insurance policies have been taken out by the members wishing to take advantage of the group insurance plan offered through the Association, the total number of policies in force on February 28 being 9,471. The total number of claims paid at the same date was sixty, amounting to $152,000.

ANNOUNCEMENTS*

CALENDAR OF MEETINGS

American Dental Association, Memphis, Tenn., Oct. 19-23, 1931.

American Board of Orthodontia, St. Louis, Mo., April 20, 1931.

American Dental Hygienists' Association, Memphis, Tenn., Oct. 19-23, 1931.

American Dental Society of Europe, Paris, France, July 29-August 1, 1931.

American Society of Oral Surgeons and Exodontists, Memphis, Tenn., Oct. 16-17, 1931.

American Society of Orthodontists, St. Louis, Mo., April 21-24, 1931.

International Dental Congress, Paris, France, Aug. 3-8, 1931.

International Orthodontic Congress, London, July 20-24, 1931.

International Stomatologic Congress, Budapest, Sept. 2-7, 1931.

Ontario Dental Association, Toronto, May 26-29.

*Announcements must be received by the fifth day of the month in order to be published in the forthcoming issue of THE JOURNAL.

Committee on Costs of Medical Care, Washington, D. C., September 17-24.

Northern Ohio Dental Association, Cleveland, June 1-4.

Society for Advancement of General Anesthesia in Dentistry, New York City, third Monday in February, April, October and December.

Upper Peninsula Dental Society, Iron River, Mich., June 25-27.

STATE SOCIETIES

District of Columbia, at George Washington University, Washington, D. C., second and fourth Tuesdays in each month from October to June, inclusive.

April

Alabama, at Mobile (14-16).
California State, at San Francisco (8-10).
Connecticut, at Hartford (28-30).
Kansas, at Hutchinson (27-29).
Kentucky, at Lexington (6-8).
Louisiana, at New Orleans (23-25).
Michigan, at Detroit (27-29).
Montana, at Helena (16-18).
New Jersey, at Atlantic City (15-17).
Oklahoma, at Oklahoma City (21-23).
Tennessee, at Nashville (21-24).

May

Illinois, at Peoria (12-14).
Indiana, at Indianapolis (18-20).
Iowa, at Des Moines (5-7).
Maryland, at Baltimore (4-6).
Massachusetts, at Boston (4-7).
Missouri, at Kansas City (25-29).
Nebraska, at Omaha (18-21).
New York, at New York City (12-15).
North Carolina, at Winston-Salem (4-6).
North Dakota, at Fargo (12-14).
Pennsylvania, at Pittsburgh (5-7).
South Carolina, at Columbia (7-8).
South Dakota, at Huron (11-12).
Texas, at Houston (12-15).
Vermont, at Burlington (20-22).
Virginia, at Old Point Comfort (11-13).
West Virginia, at Huntington (18-20).

June

Arkansas, at Little Rock (1-3).
California Southern, at Los Angeles (8-13).
Georgia, at Atlanta (10-12).
Maine, at South Poland (18-20).
Mississippi, at Gulfport (4-6).
Nevada, at Reno (6).
Oregon, at Portland (17-20).
Washington, at Bellingham (June 30-July 1).
Wisconsin, at Milwaukee (9-11).

MEETINGS OF STATE BOARDS OF DENTAL EXAMINERS.

California, at San Francisco, May 23; at Los Angeles, June 20. Bert Boyd, Secretary, 610 S. Broadway, Los Angeles.

Colorado, at Denver, June 2-6. Z. T. Roberts, Secretary, 810 Metropolitan Bldg., Denver.

Connecticut, at Hartford, June 24-27. A. J. Cutting, Recorder, Southington.

Iowa, at Iowa City, May 25-28. Hardy F. Pool, Secretary, Mason City.

Indiana, at Indianapolis, June 15. J. M. Hale, Secretary, Mt. Vernon.

Kentucky, at Louisville, June 5-10. Robert L. Sprau, Secretary, 970 Baxter Ave., Louisville.

Maine, at Augusta, June 22-24. Alton H. Swett, Secretary, 192 State St., Portland.

Minnesota, at Minneapolis, June 12-20. Walter H. Smith, Secretary, 2337 Central Ave., Minneapolis.

New Jersey, at Trenton, June 29-July 4. John C. Forsyth, Secretary, 148 W. State St., Trenton.

Vermont, at Montpelier, June 29-July 1. H. B. Small, Secretary, Burlington.

Virginia, at Richmond, June 9. John M. Hughes, Secretary, Medical Arts Building, Richmond.

VERMONT BOARD OF EXAMINERS

The Vermont State Board of Dental Examiners will meet, June-29-July 1, at the State House, Montpelier, to examine applicants for a license to practice dentistry and dental hygiene. All applications, accompanied by examination fee, must be in the hands of the secretary at least ten days before the date of meeting. For application and other information, address

H. B. SMALL, *Secretary*
Burlington

NEW JERSEY STATE DENTAL SOCIETY

The sixty-first annual meeting of the New Jersey State Dental Society will be held in the Hotel Chelsea, Atlantic City, April 15-17. For clinic space, address E. W. Roberts, 657

Haddon Ave., Collingswood; for exhibit space, E. J. H. Schneider, 806 Clinton Ave., Newark.

F. K. HEAZELTON, *Secretary*
223 E. Hanover St.
Trenton

VIRGINIA STATE BOARD OF DENTAL EXAMINERS

The next regular meeting of the Virginia State Board of Dental Examiners will be held at the Medical College of Virginia, Richmond, beginning promptly at 9 a. m., June 9. Applicants are required to present a certificate from the state board of education showing that they have had one year of academic education equal to one year of college work. Applications, with fee and photograph, must be filed complete, ten days before the examination. For application blanks and further information, apply to

JOHN M. HUGHES, *Secretary*
715 Medical Arts Bldg.
Richmond

AMERICAN DENTAL ASSISTANTS ASSOCIATION

The seventh annual meeting of the American Dental Assistants Association will be held in Memphis, Tenn., October 19-22.

RUTH F. ROGERS, *President*
Suite 803—223 W. Jackson Blvd.
Chicago, Ill.

DENTAL HYGIENISTS ASSOCIATION OF THE STATE OF NEW YORK

The Dental Hygienists Association of the State of New York will hold its eleventh annual meeting, May 12-15, at the Hotel Pennsylvania, New York City.

MARY A. OWEN, *Chairman*
Publicity Committee
28 Tremaine Ave.
Kenmore, N. Y.

MINNESOTA STATE BOARD OF DENTAL EXAMINERS

The next meeting of the Minnesota State Board of Dental Examiners will be held at the University of Minnesota, Minneapolis, June 12-20. For application and further information, address

WALTER H. SMITH, *Secretary*
2337 Central Ave.
Minneapolis, Minn.

SOCIETY FOR ADVANCEMENT OF GENERAL ANESTHESIA IN DENTISTRY

The annual meeting of the Society for the Advancement of General Anesthesia in Dentistry will be held, Monday evening, April 20, at the Hotel Barbizon-Plaza, 58th St. and 6th Ave., New York City. Dinner will be served at 7, the scientific session following at 8.

LEONARD MORVAY, *Secretary*
76 Clinton Ave.
Newark

DENTAL SOCIETY OF THE STATE OF NEW YORK

The sixty-third annual meeting of the Dental Society of the State of New York will be held at the Hotel Pennsylvania, New York City, May 12-15.

A. P. BURKHART, *Secretary*
57 E. Genesee St.
Auburn, N. Y.

PENNSYLVANIA STATE DENTAL SOCIETY

The Pennsylvania State Dental Society will hold its sixty-third annual meeting at the William Penn Hotel, Pittsburgh, May 5-7.

W. HARRY ARCHER, *Chairman*
Publicity Committee
322 Jenkins Arcade
Pittsburgh

AMERICAN SOCIETY OF ORAL SURGEONS AND EXODONTISTS

The next annual meeting of the American Society of Oral Surgeons and Exodontists will be held in Memphis, Tenn., October 16-17, at the Elks Hotel.

HOWARD C. MILLER, *Secretary*
55 E. Washington St.
Chicago, Ill.

MAINE DENTAL HYGIENIST ASSOCIATION

The Maine Dental Hygienist Association will meet at the Poland Spring House, South Poland, June 19.

ESTHER KELLEY, *Secretary*
655 Congress St.
Portland

AMERICAN SOCIETY OF ORTHODONTISTS

The American Society of Orthodontists will hold its annual meeting in St. Louis, Mo., April 21-24, at the Hotel Jefferson, 12th and Locust streets. All local dentists who are members of the American Dental Association and physicans are invited to attend these sessions by securing a badge from the secretary at the time of the meeting.

ST. LOUIS SOCIETY OF ORTHODONTISTS

UPPER PENINSULA DENTAL SOCIETY

The annual meeting of the Upper Peninsula Dental Society will be held June 25-27 in Iron River, Mich.

C. J. MCCARTHY, *Sec'y-Treas.*
Stambaugh

CONNECTICUT DENTAL COMMISSION

The Connecticut Dental Commission will meet at Hartford, June 24-27, for the examination of applicants for license to practice dentistry and dental hygiene and to transact any other business proper to come before it. Applications should be in the hands of the recorder at least two weeks before the meeting. For application blanks and further information, apply to

A. J. CUTTING, *Recorder*
Southington

AMERICAN DENTAL SOCIETY OF EUROPE

The forty-sixth meeting of the American Dental Society of Europe will be held in Paris, July 29-August 1, 1931, at the Majestic Hotel. Four mornings will be given to presentation of essays; three afternoons to clinics. There will be a golf tournament and motor excursions to interesting places around Paris. For information address

DAWSON BUCKLEY, *Secretary*
25 Bd. Victor Hugo
Nice, France
Cable address, Buckley, Nice

EXAMINATION FOR APPOINTMENT TO DENTAL CORPS, U. S. NAVY

A competitive examination for appointment to the Dental Corps of the United States Navy, will begin June 15, at the U. S. Naval Medical School, Washington, D. C. Candidates must be citizens of the United States, between 21 and 32 years of age at the time of appointment, and graduates of recognized dental schools. The examination will be both theoretical and clinical and the usual duration is about seven days. A circular containing full information relative to the Dental Corps and the prescribed form of application may be obtained from the Bureau of Medicine and Surgery, Navy Department, Washington, D. C. No allowance is made for the expense of applicants appearing for examination.

C. E. RIGGS, *Surgeon-General*
U. S. Navy

EXAMINATION FOR ENTRANCE INTO THE REGULAR CORPS OF THE UNITED STATES PUBLIC HEALTH SERVICE

Examination of candidates for commission as assistant dental surgeon in the Regular Corps of the U. S. Public Health Service will be held at Washingotn, D. C., June 15. Candidates must be at least 23 and not over 32 years of age. They must have been graduated in dentistry at a reputable dental college, and have had a total of seven years' educational training and practical experience. They must undergo a thorough physical examination and must satisfactorily pass oral, written, and clinical tests before a board of officers. Successful candidates will be recommended for appointment by the President, with the advice and consent of the Senate. Request for information or permission to take this examination should be addressed to the Surgeon General, U. S. Public Health Service, Washington, D. C.

H. S. CUMMING, *Surgeon-General*

BOOKS WORTH BORROWING* OR BUYING†

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AMERICAN DENTAL ASSOCIATION

212 E. Superior St., Chicago, Ill.

Anderson, G. M.	Orthodontic laboratory manual. St. Louis, Mosby, 1930. $2.00.
Appleton, J. L. T., Jr., & Bryant, C. K.	Laboratory guide in bacteriology. Philadelphia, Lea & Febiger, 1928. $2.75.
Bartels, H. A.	Outline of bacteriology. New York, W. A. Broder, 1929. $2.00.
Berger, Adolph	Principles and technique of oral surgery. Brooklyn, Dental Items of Interest Pub. Co., 1927. $7.00.
Berger, Adolph	Principals and technique of the removal of teeth. Brooklyn, Dental Items of Interest Pub. Co., 1929. $7.50.
Blunt, Katharine, & Cowan, Ruth	Ultraviolet light and vitamin D in nutrition. Chicago, University of Chicago Press, 1930. $2.50.
Bodecker, C. F.	Elementary histology for dental hygienists. New York, W. A. Broder, 1929. $1.50.
Box, H. K.	Necrotic gingivitis. Toronto, University of Toronto Press, 1930. (Pamphlet) $1.00.
Box, H. K.	Treatment of the periodontal pocket. Toronto, University of Toronto Press, 1928. (Pamphlet) $1.00.
Bregstein, S. J.	Business conduct of an ethical practice. Brooklyn, Dental Items of Interest Pub. Co., 1929. $4.00.
Broderick, F. W.	Dental medicine. St. Louis, Mosby, 1928. $6.00.
Broderick, F. W.	Dental bacteriology. Outlines of dental science. Vol. 2. Edinburgh, Livingstone, 1926. $2.50.
Brothers, E. D.	Dental jurisprudence. St. Louis, Mosby, 1928. $2.25.
Brown, A. J.	Dental metallurgy. Outlines of dental science. Vol. 11. New York, Wood, 1928. $2.50.
Buckley, J. P.	Modern dental materia medica, pharmacology and therapeutics. Philadelphia, Blakiston, 1926. $6.00.
Bulleid, Arthur	Textbook of bacteriology for dental students. St. Louis, Mosby, 1927. $4.50.
Bunting, R. W.	A textbook of oral pathology for students and practitioners of dentistry. Philadelphia, Lea & Febiger, 1929. $7.00.
Burchard, H. H., & Inglis, O. E.	Textbook of dental pathology and therapeutics for students and practitioners. Philadelphia, Lea & Febiger, 1926. $7.50.
Burkhart, H. J.	Care of the mouth and teeth. (National Health Series.) New York, Funk & Wagnalls, 1928. $.30.

*Books may be *borrowed* by members of the Association for a period of one week after date of receipt; and if not reserved for some one else, the period will be extended on request. A deposit of $2.00 for each volume to be sent at one time should accompany all requests for books. This will be refunded on return of books.

†If you wish to *purchase* books, indicate plainly which books you desire and enclose check with order.

Cahn, L. R.	Basic principles of general and oral pathology. Brooklyn, N. Y., Dental Items of Interest Pub. Co., 1929. $4.50.
Diamond, M.	Dental anatomy. A graphic presentation of tooth forms with an original technique for their reproduction. New York, Macmillan, 1929. $5.00.
Doxtater, L. W.	Procedures in modern crown and bridge-work. Brooklyn, N. Y., Dental Items of Interest Pub. Co., 1931. $8.00.
Endleman, Julio	Special dental pathology: a treatise for students and practitioners. St. Louis, Mosby, 1927. $7.00.
Federspiel, M. N.	Harelip and cleft palate. St. Louis, Mosby, 1927. $5.00.
Feldman, M. H.	Manual of exodontia. Philadelphia, Lea & Febiger, 1930. $3.50.
Fones, A. C.	Mouth hygiene; a textbook for dental hygienists. Philadelphia, Lea & Febiger, 1927. $5.00.
Fones, A. C.	Preventive dentistry. Philadelphia, Lea & Febiger, 1925. $2.75.
Foote, J. S.	Bone as a measure of development: When and how we acquired our teeth. Chicago, American Dental Association, 1928, $4.00.
Goepp, R. M.	Dental state board questions and answers. Philadelphia, Saunders, 1928. $4.50.
Goslee, H. J.	Principles and practice of crown and bridge-work. Brooklyn, Dental Items of Interest Pub. Co., 1926. $7.50.
Greenfield, A. L.	Interpretation of dental radiograms. Rochester, N. Y., Ritter Dental Mfg. Co., 1926. $2.50.
Gregory, W. K.	Our face from fish to man. New York, Putnam, 1929. $4.50.
Gwathmey, J. T.	Textbook of anesthesia. New York, Macmillan, 1929. $7.50.
Gwinn, C. D.	Textbook of exodontia. Philadelphia, Lea & Febiger, 1927. $2.75.
Haden, R. L.	Dental infection and systemic disease. Philadelphia, Lea & Febiger, 1928. $2.50.
Headridge, Davis, & Gibson, S. K.	Dental anatomy, human and comparative. Outlines of dental science. Vol. 6. New York, Wood, 1928. $2.50.
Hogeboom, F. E.	Practical pedodontia or juvenile operative dentistry and public health dentistry. St. Louis, Mosby, 1927. $3.50.
Jordan, M. Evangeline	Operative dentistry for children. Brooklyn, Dental Items of Interest Pub. Co., 1927. $5.00.
Kanner, Leo	Folklore of the teeth. New York, Macmillan, 1928. $4.00.
Kells, C. E.	Dentists' own book, including a complete bookkeeping and recording system. St. Louis, Mosby, 1925. $7.50.
Kells, C. E.	Three score years and nine. New Orleans, The Author, 1926. $8.00.
Kennedy, Edward	Partial denture construction. Brooklyn, N. Y., Dental Items of Interest Pub. Co., 1928. $7.50.
Kent, E. N.	Business side of dentistry. St. Louis, Mosby, 1929. $5.00.
LeGro, A. L.	Ceramics in dentistry. Brooklyn, N. Y., Dental Items of Interest Pub. Co., 1926. $7.50.
Leriche, R., & Policard, A.	Normal and pathological physiology of bone. St. Louis, Mosby, 1928. $5.00.
Livingston, Alexander	Dental histology. Outlines of dental science. Vol. 10. New York, Wood, 1928. $2.50.
Logan, J. D.	Dental prosthetics. Outline of dental science. Vol. 4. Edinburgh, Livingstone, 1926. $2.50.
Marriott, W. M.	Infant nutrition: a textbook of infant feeding for students and practitioners of medicine. St. Louis, Mosby, 1930. $5.50.
Marsden, P. H.	Dental materia medica. Outlines of dental science. Vol. 3, Edinburgh, Livingstone, 1926. $2.50.
Maximow, A. A., & Bloom, Wm.	Textbook of histology. Philadelphia, Saunders, 1930.
McCollum, E. V., & Simmonds, Nina	Food, nutrition and health. Baltimore, Authors, 1928. $1.50.

McCollum, E. V., & Simmonds, Nina	Newer knowledge of nutrition. New York, Macmillan, 1929. $5.00.
McCoy, J. D.	Applied orthodontia. Philadelphia, Lea & Febiger, 1931. $4.00.*
McCaw, Emma J.	Dental assistant. St. Louis, Mosby, 1926. $1.50.
McGehee, W. H. O.	Textbook of operative dentistry. Philadelphia, Blakiston, 1930. $10.00.
Marshall, J. A.	Diseases of the teeth; their diagnosis and treatment. Philadelphia, Lea & Febiger, 1926. $4.50.
Mead, S. V.	Diseases of the mouth. St. Louis, Mosby, 1928. $10.00.
Mellanby, May	Diet and the teeth: an experimental study. Part I. Dental structure in dogs. London, His Majesty's Stationery Office, 1929. $5.50.
Merritt, A. H.	Periodontal diseases: diagnosis and treatment. New York, Macmillan, 1930. $4.00.
Moorehead, F. B., & Dewey, Kaethe W.	Pathology of the mouth. Philadelphia, Saunders, 1924. $7.00.
Nevin, Mendell, & Puterbaugh, P. G.	Conduction, infiltration and general anesthesia in dentistry. Brooklyn, Dental Items of Interest Pub. Co., 1927. $6.00.
Nichols, I. G.	Prosthetic dentistry: an encyclopedia of full and partial denture prosthesis. St. Louis, Mosby, 1930. $12.50.
Orban, Balint	Dental histology and embryology. Philadelphia, Blakiston, 1929. $5.00.
Osgood, H. A.	Teeth and jaws roentgenologically considered. Annals of roentgenology, volume 5. New York, Hoeber, 1929. $10.00.
Ottolengui, Rodrigues	Table talks on dentistry. Brooklyn, Dental Items of Interest Pub. Co., 1928. $7.00.
Perry, Maude A.	Dietetics and nutrition. St. Louis, Mosby, 1930. $2.50.
Pollia, J. A.	Fundamental principles of alveolo-dental radiology. Brooklyn, Dental Items of Interest Pub. Co., 1930. $8.00.
Posner, J. J.	Minor oral surgery simplified. Philadelphia, Patterson & White, 1928. $3.00.
Prinz, Hermann	Dental formulary. Philadelphia, Lea & Febiger, 1930. $3.50.
Prinz, Hermann	Dental materia medica and therapeutics. St. Louis, Mosby, 1926. $7.50.
Prinz, Hermann	Diseases of soft structures of teeth. Philadelphia, Lea & Febiger, 1928. $6.50.
Raper, H. R.	Clinical preventive dentistry. Rochester, N. Y., Ritter Dental Mfg. Co., 1926. $3.50.
Rapp, F. W.	Elements of anatomical articulation or the mathematics of dental prosthetics. London, Bale, 1930. $1.25.
Roberts, Lydia J.	Nutrition work with children. Chicago, University of Chicago Press, 1927. $3.50.
Rose, Mary S.	Foundations of nutrition. New York, Macmillan, 1927. $2.75.
Schroff, Joseph	Fundamentals of pathology. New York, W. A. Broder, 1929. $2.50.
Sears, V. H.	Full denture procedure. New York, Macmillan, 1929. $2.00.
Shaw, D. M.	Dental prosthetic mechanics. London, Arnold, 1927. $7.50.
Silverman, S. L.	Principles and practice of oral surgery. Philadelphia, Blakiston, 1926. $6.00.
Simon, P. W.	Fundamental principles of systematic diagnosis of dental anomalies. Boston, Stratford, 1926. $5.00.
Simpson, C. O.	Technic of oral radiography. St. Louis, Mosby, 1928. $5.00.
Smith, G. F. R.	Dental anesthesia. Outlines of dental science. Vol. 1. Edinburgh, Livingstone, 1926. $2.50.
Sorrin, Sidney, & Miller, S. C.	Practice of periodontia. New York, Macmillan, 1928. $3.50.
Steadman, F. St. J.	Pyorrhea alveolaris. St. Louis, Mosby, 1927. $9.25.

*The price of the 1931 edition has not been set.

Stillson, W. C.	Dental anatomy: classroom and laboratory quiz compend with supplementary notes. Philadelphia, Saunders, 1929. $2.25.
Stoloff, C. I.	Your teeth. New York, Dutton, 1929. $2.50.
Suter, A. B. W.	Dentistry—a profession and a business. Rochester, N. Y., Ritter Dental Mfg. Co., 1930. $7.50.
Tanguy, T. V.	Science and practice of actinotherapy. St. Louis, Mosby, 1928. $3.00.
Turner, C. R., & Anthony, L. P.	American textbook of prosthetic dentistry. Philadelphia, Lea & Febiger, 1928. $10.00.
Tyree, C.	Dental health in the prevention of disease. London, Kentucky, Author, 1927. $2.75.
Wallace, J. S.	Physiology of oral hygiene and recent research. London, Bailliere, Tindall & Cox, 1929. $1.50.
Ward, L.	American textbook of operative dentistry. Philadelphia, Lea & Febiger, 1926. $10.00.
Weinberger, B. W.	Orthodontics: an historical review of its origin and evolution. 2 vols. St. Louis, Mosby, 1926. $25.00.
Winter, G. B.	Principles of exodontia, as applied to the impacted mandibular third molar. St. Louis, Amercan Medical Book Co., 1926. $15.00.
Winter, Leo	Textbook of exodontia. St. Louis, Mosby, 1927. $10.00 .
Woodbury, C. E.	Making and filling of cavities in the proximal surface of the front teeth with gold foil. Omaha, Neb., Author, 1929. $5.00.
Zemsky, J. L.	Oral diseases: practical treatise offering diagnostic and therapeutic aid to the practitioner of medicine and dentistry. Brooklyn, N. Y., Physicians and Surgeons Book Co., 1930. $8.00.
Zemsky, J. L.	Outline of oral surgery. Brooklyn, N. Y., Physicians and Surgeons Book Co., 1930. $4.50.
Zoethout, W. D.	Textbook of physiology. St. Louis, Mosby, 1928. $4.50.

A list of the package libraries was published in the October, 1930, issue of THE JOURNAL.

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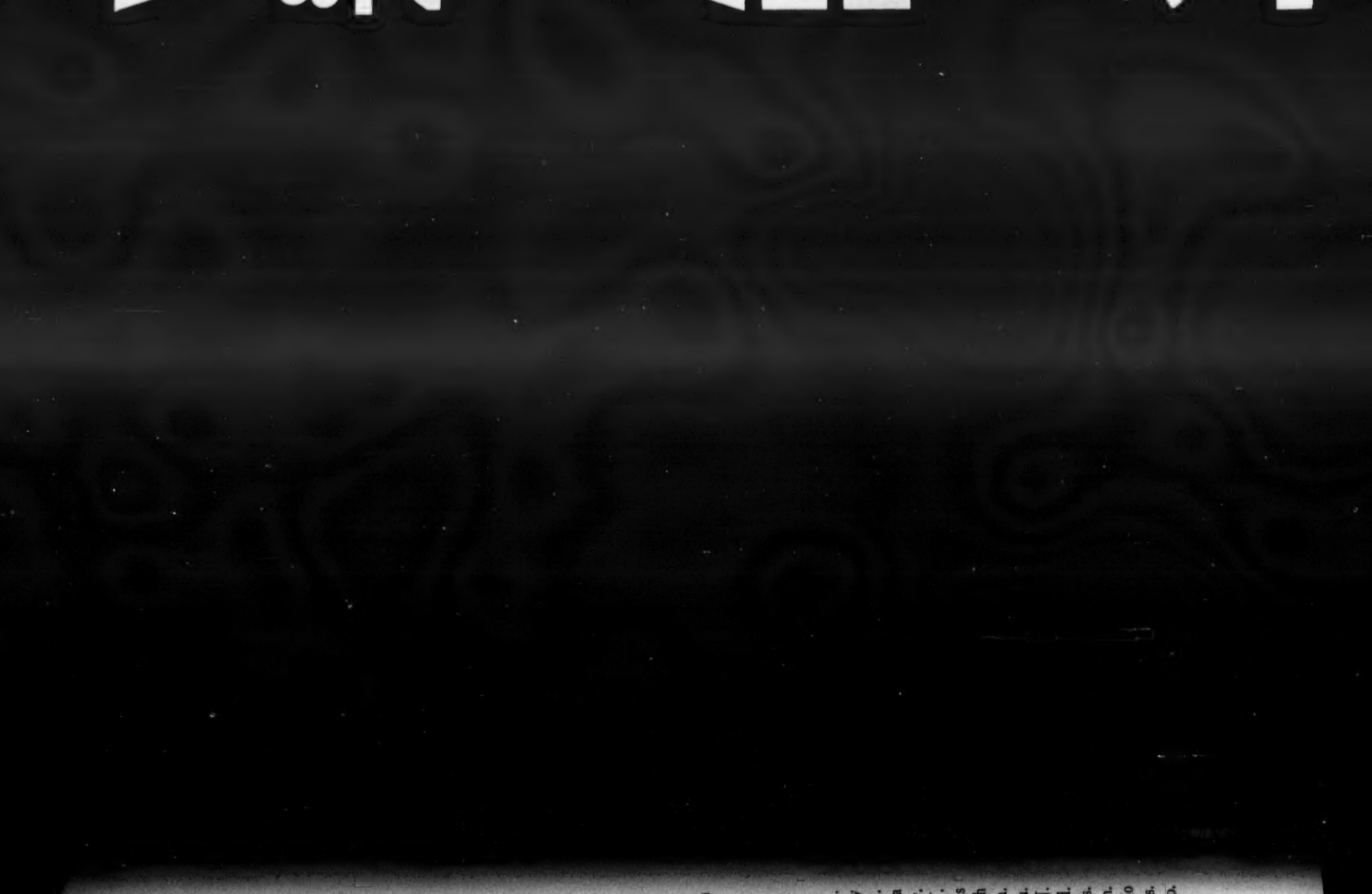
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